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ORIGINAL ARTICLES

THE PALEONTOLOGY, EVOLUTION, EMBRYOLOGY AND POSTNATAL DEVELOPMENT OF THE HUMAN FACE, JAWS AND TEETH. A SYNOPSIS*

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PALEONTOLOGY AND EVOLUTION

ALL of us, irrespective of race, creed, social position, occupation or other interests are constantly cognizant of and are forever studying, either consciously or subconsciously, the faces of our fellow men. It is therefore apparent that a thorough study of faces should prove unusually interesting and instructive.

To understand the face thoroughly, it is only fair to assume that we should start at the bottom of the ladder in the scale of life and inspect the simplest type of face and then trace upward through the stages of development of this simple face and see how it is gradually changed and molded in form to that of modern man.

Biology teaches us that all living things respond to external environment. From geology we learn that different parts of the earth have periodically risen above the surface of the sea and have then become submerged beneath the surface of the water. These periods or eras have been accompanied by various climatic changes ranging from arid cold to humid torrid temperatures. Paleontology shows that characteristic types of life have existed in these various stages. Geologists tell us that the rocks of the earth's crust are composed of different layers, each typical of the period or age in the development of the earth. It is estimated that this process of development of the earth has consumed approximately a period of a billion and a half years. At each age one type of life has dominated over all other forms, so much so that there is a direct relationship between cli-

*Presented in lecture form under the auspices of the Department of Anatomy, to the sophomore students at the Medical School of Temple University.

matic and geologic conditions and the dominating type of life existing. From the biologic point of view we see then that as environment changed there was a corresponding change in the form and structure of the animal and vegetable kingdoms. These facts have been gleaned from the discovery of fossil remains of preexisting life in various strata of the earth's surface.

The earliest era is called the Archeozoic period. Its characteristic type of life in the earlier part is unicellular, while in the latter part multicellular organisms are to be found. The next period is the Primary or Paleozoic period. This is composed of five different ages. In the earliest age we find the marine invertebrates and later the beginning of the vertebrates in the form of fishes. Following the fishes, the amphibians make their appearance and life begins a terrestrial existence. This is followed, in the later ages of this period, by the reptiles.

The next era is the Secondary or Mesozoic period. During the ages within this period the reptiles undergo a differentiation, and the mammal-like reptiles make their appearance and finally develop into true mammals by the end of the era. This is followed by the Tertiary or Cenozoic period, commonly termed the age of mammals. The mammals are by far the dominant form of animal life during this era. They now undergo various degrees of differentiation and specialization, with the disappearance of the more early or primitive forms of mammalian life.

Next follows the Quarternary or Psychozoic period, characterized in the early part or Pleistocene age by the appearance of the modern mammal and in the later age or Holocene (recent) epoch with the appearance of Man.

From the above brief description of the geologic periods of the earth, it will be seen that during each period a characteristic type of life predominated with other forms present in lesser degree. There is, however, a blending or overlapping of the various types from one period to another. The simpler forms are present at the beginning of each period, they progress gradually in development and predominate in that period and then undergo progressive changes and form a new type towards the end of the same period. They then overlap into the next higher period as the typical form of life for this higher era.

We shall see that these changes which take place in the organism are usually brought about by a reduction in the number of the elements and differentiation of the remaining parts of the body as we proceed up the ladder of life. This all comes about as a result of the organism's attempts to adapt itself to its changing environment.

With this background, we are in a better position to study the face. The next question which logically enters our mind is the reason or necessity for possessing a face. Its fundamental purpose is to enable the organism to procure and ingest its food necessary for the maintenance of life.

Glancing swiftly at one of the simplest forms of life as a paramecium, it will be seen that the mouth area consists of a simple slit in the body and surrounding this mouth area the protoplasm is more receptive to chemical and photic stimuli, which enables the organism to orientate itself with reference to its environment. This simple facial region becomes more complex in the latter part of the Archeozoic era when the multicellular organisms of the invertebrate group, with their complicated mouth areas, make their appearance.

Passing into the Primary or Paleozoic period, we arrive at the beginning of the vertebrates. The lowest forms are the ostracoderms in which the mouth is really the first gill-slit. The skull is composed of cartilage and contains the organs of sight, smell, and an incomplete brain case. Behind this primitive head are the seven pairs of gills with their corresponding gill or branchial arches.

The ancient type of shark represents the next higher form of organism. The face of this lowly creature contains practically all of the elements in their primitive form which compose the face of man. The skull can be divided into three parts: first, the brain case enclosing the brain; second, the capsules which are structures containing the special sense organs of sight, smell and the elementary organ of hearing; and third, the jaws. The jaws and the bars by which they are attached to the brain case are derived from the first and second pair of branchial or gill arches and are known as *primary jaws,* serving as a framework for the mouth cavity.

The structure of the skull is composed of cartilage instead of true bone, as is found in higher forms, and it is covered with a dense, tough skin. On the surface of this skin are tiny projections called shagreen which become quite large in the region about the mouth and serve as teeth. This localized shagreen forms the basis of the *secondary jaws* which become greatly developed in the higher forms of life. The lower jaw, at its posterior border, forms an articulation with the upper jaw which is quite different from that found in man where the mandible articulates with the base of the skull.

The olfactory organs of the shark are highly developed because the animal is dependent upon this means for the detection of its food supply. There is a slight channel extending from the olfactory pits, the external nasal openings, into the side of the mouth which develops in higher forms into the true nasal tract. This passage-way in the shark does not serve the purpose of respiration as it breathes by means of gills, but is an aid in the ultilization of the sense of smell and taste. The eyes of the shark are restricted to the side of the head and are fundamentally similar to human eyes.

The organ of hearing, if it may be so termed, does not enable the shark to recognize sound waves, but enables it to orientate itself with relation to the planes of space. This is composed of semicircular canals and is homologous in structure and function to similar organs in the human which are to be found in the inner ear.

The tongue merely consists of a thickening in the floor of the mouth, and the teeth as described above are really specialized formations of the skin. It thus becomes apparent that the elements comprising the head and face of man are to be seen in thir primitive form in the head of the shark, and as Gregory, in his book, *Our Face From Fish to Man,* so aptly states "the shark is the human prototype."

Stepping up to the next rung in the ladder of life's scale, we come to the air-breathing fishes or ganoids of Pre-Devonian times. These fishes were capable of breathing air above the surface by means of primitive lung structures, as well as underneath the water by means of their gills. The skin which covered the skull of the shark has in this group, become impregnated with lime salts and developed into true bone forming the dermocranium, while the cartilaginous struc-

tures (capsule and brain case) have also become calcified, forming the endocranium. The dermal covering or shagreen which covered the primary jaws of the shark also became calcified at this stage transforming the secondary jaws into true bone. The secondary jaws give rise to teeth. As development progressed the primary jaws gradually disappeared and now make their appearance only in the embryonic stage of higher forms of life. The upper secondary jaw, among other bones, contains the maxillary and premaxillary bones on each side, while the lower secondary jaw contains, among other bones, the dentary or tooth-bearing bone located in the anterior region of the lower jaw. These ganoids are not in the direct line of ascent of man, but are some offshoot of the form which followed the shark.

Referring again to geology, we see that following the Devonian period, the land area had been increased by a rising of the continents above the water. It therefore became imperative that life adapt itself to a more terrestrial form of existence. At this period the amphibian class made its appearance. They are capable of living on both land and water.

On examination of the skull of this group in the area between the upper jaw and the gill chambers, we notice that the bony plates present in fishes have disappeared leaving an exposed area known as the otic notch which contains the middle ear. The bones of the skull in this group have become reduced in number and more refined. This principle can be traced through successive stages and seems to be nature's method of reaching a more perfect type. The olfactory tract is developed into a definite channel, and its posterior opening is in the front part of the roof of the mouth, serving partly as a respiratory passage-way. The cochlea or true organ of hearing in conjunction with the middle ear makes its appearance at this time. The tongue becomes muscular and protrusile while the teeth remain rudimentary and undifferentiated.

The early forms of reptiles make their appearance in the late Paleozoic era and become more developed and specialized in the early Mesozoic era. They live entirely on land. The reptilian skull contains fewer bones and they start to disappear beneath the surface of the body. The temporal fossa makes its appearance while the maxillary or tooth bearing bone of the upper jaw, together with the dentary or tooth bearing bone of the lower jaw, becomes larger. The conical, single rooted, homodont (similar pattern) teeth are still present, together with the simple joint between the upper and lower jaws. The higher forms or mammal-like reptiles approach mammalian characteristics and possess the secondary or hard palate with the olfactory channel opening into the pharynx.

In the latter part of the Mesozoic period the ancient mammals make their appearance and become more specialized and more modern during the Tertiary era, at which time they are dominant. They are characterized by the complete disappearance of the bony structure beneath the surface of the body. Hair and other adjuncts present themselves for the maintenance of bodily temperature as these animals are warm blooded. The bones of the skull are fewer in number while the dentary bone of the lower jaw has progressed backward and formed a new joint with the temporal bone the temporomandibular articulation which is situated above the occlusual plane of the teeth. The secondary palate is com-

plete, being formed by the premaxilla, maxilla and palate bones. The accessory air sinuses have their inception in this group.

The dentition is of the heterodont type, or teeth of dissimilar patterns. The teeth are divided into incisors, canines, premolars and molars, the roots of some of these being multirooted in form. This is due to a change in the type of diet. Two sets of teeth are present. The tongue is fundamentally the same as in man, while sight is more refined and the outer ear makes its appearance.

In the early Cenozoic era, a higher type of organism is encountered, the lower primates, which are adapted to living in trees. They have a larger brain case and brain. The lower jaw is long and slender with both halves being ununited. The premaxillary and maxillary bones of the upper jaw are also not fused. The muzzle is still long, but the sense of smell becomes less acute as the sensitivity of the organ of sight increases. The eyes move toward the front. The upper lip is separated in the midline, and the dentition contains four upper and four lower premolars with sharp cusps suitable for an insectivorous diet. The external ears begin to take on manlike characteristics.

The higher primates, or anthropoids, approach the human type in appearance. They assume a vertical posture which, according to Gregory, is responsible for the bending downward of the face upon the brain case. The brain case becomes much larger, and the upper jaw grows downward in a vertical position instead of horizontal. The maxilla and premaxilla become fused in the adult. The lower jaw is shortened and becomes deeper. It is united at the symphysis, the inferior lingual portion of which slopes backward towards the tongue forming the "ape-shelf." The ramus of the lower jaw is broad. The upper and lower incisor regions are retracted with the incisor teeth meeting in an edge-to-edge bite. The canines are large and two upper and two lower premolars are present. The molar cusps are low because of the herbivorous diet.

The muzzle is shortened with the nostrils remaining far apart. The upper lip is fused in the midline and the tongue is broad. The eyes have moved forward and are capable of biconjugate movement and stereoscopic vision.

This brings us to the threshhold of human existence as represented by prehistoric man who was supposed to have originated anywhere from 19 to 35 million years ago. It is agreed that this group originated from some primitive type of anthropoid. There are various types or races of prehistoric man. They possess a combination of human and apelike characteristics; some portions of the skull resemble that of the ape while other portions possess a human appearance. The Heidelberg jaw is the oldest trace of man on record. It is heavy and larger than the modern mandible and does not possess an ape-shelf. The teeth are stout and have no constriction or neck where the crown joins the root. The chin is receded.

In the Neanderthal skull, the mandible has no chin, having large teeth with constricted necks, and the incisors are inclined vertically with the uppers slightly overlapping the lowers.

The Aurignacian skull is long and narrow. The teeth have a constriction at the neck and are smaller than the teeth of the Heidelberg jaw. The mandible is powerful and has a prominent chin.

All through this vast age there are other forms of prehuman man which have

a wide range of facial characteristics. This brings us to the top of the ladder, and we arrive at modern man described by Gregory as having a small mouth, weak jaws, reduced dentition, projecting chin, delicate projecting nose, pale skin and large brain.

Therefore, it is quite clear that man has evoluted from simple forms through years and years of gradual changes and modifications as a result of an ever changing environment, and he will probably continue to evolve in the future. If it were possible to examine man millions of years hence, we probably should be astonished at the appearance of our posterity.

EMBRYOLOGIC DEVELOPMENT

Having traced the phylogenetic development of the human face, we shall now endeavor to follow its embryologic development. The fertilized ovum is the result of the entrance of the spermatozoan or male germ cell into the ovum, or female germ cell. This takes place within the female genital organs after each germ cell undergoes changs known as *maturation* which reduces the number of chromosomes in each germ cell to one-half the number of the typical human or somatic cell, so that when both the male and the female cell unite and their nuclei fuse, the combined number of chromosomes equal forty-eight, the normal number of the human cell.

Immediately following fertilization, the ovum undergoes *segmentation* or division into a number of cells called blastomeres. A cavity appears in this cell mass or blastodermic vesicle, as it is termed, resulting in a collection of cells at one area just beneath the surface, known as the *embryonic area.* The cells in this area differentiate into an outer layer or ectoblast and an inner layer or entoblast. A little later a third or intermediate layer of cells appears between the ectoblast and entoblast known as the mesoblast. These three layers give rise to all of the organs and tissues of the body. All epithelial structures develop from the ectoblast and entoblast, while connective tissue structures arise from the mesoblast. This process of layer formation and differentiation is known as *gastrulation.* The foregoing period of development is known as the *stage of the ovum.*

A series of changes now begins to take place known as the fundamental embryologic processes. These initiate the stage of the embryo. The ectoblast in the region of the embryonic area rises in the form of two folds along the long axis of the embryo which finally unite forming a closed tube known as the neural canal, which gives rise to the cerebrospinal system. Directly internal or mesial to this canal, the entoderm undergoes thickening and differentiation forming a cord known as the chorda or notochord, the rudimentary vertebral column. The mesoblast divides into two portions, excepting in the region of the notochord and neural canal where it remains undivided. The space or cavity between the two divided layers of mesoderm is known as the body cavity or coelom. The outer layer of this divided mesoderm unites with the ectoderm forming the somatopleure which forms the body wall. The inner layer of the mesoderm unites with the entoderm forming the splanchnopleure which forms the walls of the digestive tract. There is a portion of mesoderm which is adjacent to the notochord and

neural canal, and does not become split into two layers, but becomes segmented and forms the somites, which give rise to the vertebrae.

Coincidently with these changes taking place within the embryo, activity of a different nature takes place on its surface. This activity is for the purpose of establishing contact between the embryo and the uterus of the mother which enables the embryo to obtain nourishment and makes possible its respiration and excretion of waste products. This is accomplished through the formation of the chorion, a membrane surrounding the embryo and in contact with the uterine wall, and also by the allantois and umbilical vessels passing from the primitive gut to the mucous membrane lining of the uterus. The amnion and amniotic cavity, which is filled with fluid, also surround the embryo but are internal to the chorion. These latter structures serve as a means of suspension and protection to the embryo.

About the fifteenth day, at the termination of the stage of the blastodermic vesicle, the body of the embryo is cylindrical in outline with differentiation into cephalic and caudal poles. The cephalic end is practically bent upon itself and contains the extremity of the neural tube in the form of the brain vesicles. During the third week a group of five bars on each side of the cephalic segment make their appearance. They are located in the region which develops into the neck of the fetus, and are known as visceral arches, the spaces or clefts between these ridges are the visceral clefts on the external surface, while internally, or in the region of the future pharynx, these furrows or clefts are known as the pharyngeal pouches. These structures represent in rudimentary form the branchial arches and clefts of lower vertebrate forms, particularly seen in fishes for the purpose of respiration. The visceral arches consist of bars having a core of mesodermic tissue which is covered on the external surface by ectoderm and on the internal surface by entoderm.

From the above brief description it is readily seen that man in his embryologic development passes through stages somewhat homologous with his development from simple forms of life. The fertilized ovum represents the unicellular organism stage of development, while the period of segmentation represents the stage of development of a multicellular organism. With the appearance of the embryologic processes, as the notochord, etc., the embryo has advanced to the category of the vertebrate group, while the appearance of the visceral arches brings the embryo to the fish stage of development and so on the developing embryo repeats the phylogenetic development of man.

We shall now focus our attention to the facial region and study its development. About the thirteenth day a depression is seen on the ventral surface of the head area beneath the brain vesicles. This depression or cavity is known as the stomodeum or primitive oral cavity which very soon communicates at its posterior end with the primitive gut. This region develops into the future pharynx. About the third week two depressed areas, the nasal pits, located above the primitive mouth make their appearance. These are separated by a broad bar of tissue passing down in a caudal direction from the forebrain vesicle. This projection is known as the frontonasal process. It is at this time that the visceral arches appear. The first arch on both sides divides into two segments, the max-

illary process and the mandibular process which progress ventrally toward the median line. The mandibular process unites in the median line with its fellow from the opposite side forming the inferior boundary of the oral cavity and develops into the lower jaw and the structures in the floor of the mouth with the aid of the second arch. The maxillary processes also proceed toward each other and unite with the descending frontonasal process. The result of this union outlines the roof of the oral cavity and floor of the nasal fossae. The nasal pits deepen, encroaching upon the frontonasal process and divide it into the medial and lateral processes on each side forming the median and lateral boundaries of each nasal pit or channel. At this time the nasal pits are closed at their posterior end, but about the thirty-fifth day the posterior boundaries rupture, forming an opening upon the roof of the primitive oral cavity. These openings are situated well anteriorly and are known as the primitive posterior nares. The floor of the primitive nasal cavity which is also the roof of the primitive mouth cavity and extends posteriorly to the primitive posterior nares is termed the primitive or primary palate. This primary palate has been mentioned in the description of the face of the shark. Directly posterior to the primary palate are the palatal processes of the maxillary portions of the first visceral arches. At first these are directed downward with the tongue situated between them. As the tongue descends, the palate processes rotate and proceed toward each other in a horizontal plane. They unite in the midline with each other and with the nasal septum forming the secondary, maxillary or mammalian palate, and thus completely occlude the nasal from the oral cavity. In this manner the posterior openings of the nasal fossae are extended to the pharynx and form the secondary posterior nares. If for any reason, there is a failure of union between any portion of the frontonasal process and the maxillary process or between the frontonasal process and the palatal portions of the maxillary process at the so-called critical periods or definite time of union as described by Schaeffer in his article on "Some Problems in Genesis and Development With Special Reference to the Human Palate," some form of harelip or cleft palate results.

It is to be seen then, that from the medial portion of the frontonasal process are developed the nasal septum, bridge of the nose, middle portion of the upper lip and intermaxillary bone, while the alae of the nose develop from the lateral nasal process. The maxillae and palate bones are developed from the maxillary portion of the first visceral arch. The mandibular process of the first visceral arch forms the lower jaw and two of the ear ossicles, the malleus and incus. From the second visceral arch is developed the third ear ossicle, the stapes, and the styloid process, stylohyoid ligament, and the lesser cornua of the hyoid bone. The third visceral arch forms part of the body and the greater cornua of the hyoid bone, while the fourth and fifth visceral arches give rise to the thyroid cartilages of the larynx.

Associated in the development of the above parts is the formation of the teeth. About the seventh week of fetal life a bar or ledge of ectoderm projects downward into the surrounding mesoderm in the region of the future jaws. This is known as the dental ledge. From this ledge projections arise from which the deciduous teeth are formed. The lower border of each projection is in the shape of a rod at right angles to the projection. This becomes cup-shaped by

the underlying mesoderm. The invagination continues until a definite mass of mesodermic tissue, the dental papilla, becomes included within this cup-shaped ectoderm or enamel organ. The enamel organ consists of three layers, the inner layer contains the ameloblasts, cells which produce the enamel. The cells about the periphery of the dental papillae become specialized and are known as the odontoblasts which give rise to the dentine of the future tooth. The central portion of the dental papillae, not giving rise to the odontoblasts, retains its embryonal character and becomes the dental pulp of the tooth. When the sheath of the enamel organ surrounding the root of the future tooth disappears, the cementoblasts, a type of bone forming cell, deposit cementum over the dentine of the root. The enamel organs of the permanent teeth with the exception of those forming the second and third molars are formed before birth.

By the fifth week the head attains relatively large proportions. From this period to the end of gestation, the developing organism is termed a fetus. By the sixth week, the visceral arches disappear and the head takes on a more human appearance. During the seventh and eighth week, the head becomes raised from the trunk, the eyelids appear and the external ear assumes its typical form. By the third month, the external features become more characteristic, and the neck appears with the further raising of the head from the trunk. During the succeeding months the fetus becomes larger and heavier, and its development progresses until the ninth month when its appearance approaches the newly born infant. At term the fetus has developed to the extent that it is capable of leading an independent existence, and birth occurs with the infant entering its new external environment.

Before concluding the embryologic development of man a few facts relative to bone formation are apropos. The bones of the skull develop either in membrane, i. e., membranous bone formation, or from preexisting cartilage, i. e., endochondral bone formation. In membranous bone formation calcification takes place directly within the mesenchymal tissue, while in endochondral bone formation the future bone is first mapped out in cartilage which later becomes transformed into bone. The bones of the sides and base of the skull, the ear ossicles, ethmoid and inferior turbinates pass through the cartilaginous stage before calcification takes place. The bones of the cranium and most of those of the face are formed in membrane. Some bones are partly of membranous and partly of cartilaginous origin.

POSTNATAL DEVELOPMENT

Before proceeding with the description of the changes that take place in the human face from birth to senility a few general remarks pertaining to growth and development are in order.

While the terms growth and development are often used simultaneously and interchangeably, there are distinctions which their use implies. By growth is usually meant an increase in size or amount of body material, whereas development refers to the rearrangement, differentiation and molding of the various parts of the body during growth.

Growth does not proceed continuously and at a regular even rate but is intermittent with increases and decreases in its rate. The increase and decrease

in the intensity of the rate of growth has been termed by Boas, "accelerations and retardations of growth," respectively. Therefore during periods of acceleration affecting the face, distinctive changes are to be noted in that area, while the periods of retardation are marked by slight changes. These periods of acceleration taking place in the facial area are closely related to the eruption of the teeth and, as the process of dentition or eruption of the teeth is a symptom or manifestation of growth, it therefore is quite evident that the eruption of the teeth mark definite periods of development within the individual. The appearance of the various teeth may represent in a broad, general manner the age, or more correctly, the period of development of the individual.

In a most detailed and valuable research, Hellman has taken a large collection of human skulls, in which there were no means of ascertaining the chronologic age and divided them into groups according to the development of their dentitions, which in a broad manner were representative of their ages. This research is one of the most extensive of its kind and is up to the present the most scientific report on the development of the human face.

In the following discussion we shall employ the above groups as outlined by Hellman in his article entitled, "Changes in the Human Face Brought About by Development." It is important therefore that we describe them at this time. These are as follows.

"Stage I designates that period of early infancy before the completion of the deciduous dentition.

"Stage II designates the period of late infancy at the completion of the deciduous dentition.

"Stage III designates the period of childhood, when the permanent first molars are erupting or have taken their positions, in addition to which some or all of the deciduous incisors have been lost and are replaced by their permanent successors.

"Stage IV designates the period of pubescence, when the second permanent molars are erupting or have taken their positions, in addition to which some or all of the deciduous canines and molars are lost and are being replaced by their permanent successors.

"Stage V designates the period of adulthood when the third molars are erupting or have taken their positions.

"Stage VI designates the period of old age when the occlusal surfaces of the molars are worn off to the extent of obliterating the pattern of grooves.

"Stage VII designates the period of senility, when at least half of the crowns of the teeth are worn off, in addition to which some, most or all of the teeth have been lost."

Bone is a plastic, vital tissue which does not remain fixed, but changes continually. There is a constant deposition of new bone and absorption of preexisting bone taking place in the living individual which changes the form of the bony parts. The growth of the bones of the face and skull is obtained by a combination of surface growth, i. e., deposition of new bone upon the surface of existing bone and suture growth, i. e., growth or increase of bone by calcification taking place in the region of the sutures of the bones.

In Hellman's researches, mentioned above, the size of the face was deter-

mined by measurements in three dimensions, i. e., height, width and depth. The total facial height is the distance from the nasion to the menton, and the height of other portions is their length in a vertical plane. The width is the transverse measurement in a horizontal plane at various levels of the face, while the depth is the distance measured in an anteroposterior direction.

In a general manner the areas most affected during the growth and development of the face are those portions involved in the function of respiration, e. g., nasal areas and associated sinuses, and those areas affected by mastication and speech, e. g., mouth, jaws and teeth.

Examining the head at birth, one is immediately aware of the small face as compared to the size of the cranium, the proportion being one to eight. As growth progresses, this relationship changes because the rate of growth of the face is greater than that of the brain case. In adult life the proportion becomes one to two.

The close proximity to each other of the lower border of the orbits, the lower border of the nasal opening and the mouth is characteristic of this stage of development. At birth the crowns of the incisors, the cusps of the canines and molars of the deciduous dentition and the cusps of the first permanent molars are calcified, and twenty-four of the germs of the permanent teeth are present within the jaws. Within the oral cavity, the alveolar arches are provided with pads of gum. It is therefore necessary for nature to provide space and support for the erupting teeth essential to mastication and to increase the size of the respiratory passages in order to increase the vital capacity for the growing individual.

During the period of late infancy, Stages I to II, there is a decided acceleration in growth of the total height, width and somewhat less in depth of the face.

The increase in height is mainly due to the appearance of the deciduous dentition which is usually completely erupted at two and one-half years of age. The dentition forces or wedges apart the upper and lower face, thereby increasing the total height of the face, while individually, the upper and lower face grow at a slower rate. This increase is obtained by a combination of surface and suture growth. Simultaneously with this downward growth of the jaws, there is an increase in the size of the antrum, separating the teeth from the orbit and also a lowering of the floor of the nose. The growth in the nasal area is considerably less than that in the jaws. In the lower face, the ramus of the mandible also increases in height along with the alveolar process and body of the lower jaw.

The increase in the width of the face during this period is also attained by surface and suture growth. The areas located farthest from the median line and those in the posterior region of the face widen at a faster rate than those closer to the median line and in the anterior regions of the face. Therefore, the molar regions of the jaws widen faster than the anterior regions. In early infancy, the growth in width of the jaws is for the purpose of accommodating the deciduous dentition.

Likewise in depth there is a decided amount of growth to the face, but not to the extent found in its height and width. With the eruption of each tooth, there is an increase in depth or length of the jaws. These do not grow forward but grow in a backward direction, and before each succeeding tooth erupts sufficient bone must be laid down to furnish space and support for that tooth.

Therefore the jaws increase in depth by additions formed in the posterior region. There is considerable more growth in the maxilla than in the palate bone at this time. The early closure of the suture between the intermaxillary and maxillary bones is further proof that the jaw does not grow forward. In the lower jaw surface growth takes place on the posterior border of the ramus, while absorption is active on its anterior portion, forming space thereby for the erupting posterior teeth. This has been demonstrated by Brash in his well-known experiments on madder-fed pigs.

During the next period, Stage II to III, there is a slowing up or retardation in the rate of growth of the height of the face. The extent of growth is not so much as in the previous period, although a considerable increment to its height is obtained. Both the upper and lower face also show a retardation of growth in height, while the height of the nasal area depicts an acceleration of growth in comparison to the former period.

The changes in width during this period are quite similar to those in height. There is an increase in the bizygomatic width, an increase in the palate width in the region of the first permanent molars (which attains its greatest width with the eruption of these teeth), and also a similar increase in the mandibular region. The extent of the increase here is not so great as that found in the previous period. Both the upper and the lower jaws at this time widen to accommodate the oncoming permanent teeth, in fact, spaces may be frequently seen between the anterior deciduous teeth, as their permanent successors are wider and require more room. There is a greater widening in the anterior region of the upper arch than in the same region of the lower, while posteriorly the lower jaw widens more than the similar region of the upper arch.

During this period with a retardation in the growth of the height and width of the face there is an acceleration in the rate of growth of its depth. With the eruption of the large first permanent molars during this stage, there is an increase in the depth of the palate and of the mandible in a manner similar to that previously described. Space must be obtained for this great amount of posterior growth of the jaws. Therefore, as the brain case grows forward it carries the face with it, thus creating this necessary space anterior to the base of the skull. As a result of this, there is a continual change in the relationship of the position of the face to the cranium.

Proceeding to the next period, Stages III to IV, we notice a marked acceleration of growth in the height and width of the face. This is the period approaching puberty and coincides with the general rearrangement of various parts of the body. The increase in the height of the face at this time is particularly due to the marked increase in nasal and palatal height associated with a lowering of the floor of the nose and an expanding antrum. In the lower face, the height of the ramus and the body of the mandible, particularly in the posterior region, also show a marked increase.

There is a marked spurt in width at the various levels of the face, i. e., the interorbital, nasal, bigonial and anterior palatal regions. This growth in the anterior palatal region is obtained by means of the palatal processes of the maxillary bones which send out extensions that encircle the premaxillary bone to support the large permanent canine teeth erupting at this time. Todd very clearly

depicts this manifestation in his article on "Facial Growth and Mandibular Adjustment." The posterior region of the palate shows little change in width.

The depth of the face is also increased at this time, but not to the extent shown in the change of its height and width or to the extent developed during the previous period. The second permanent molar erupting at this time is accountable for the increase in the depth of the palate and lower jaw.

This brings us to the period of adolescence, Stages IV to V. The face and its component parts now show growth in height, width and depth, but at a much slower rate than during the previous period. This stage is therefore characterized by a period of retardation. With the eruption of the third molar at this time, the usual changes in the dental region incident to the appearance of a tooth take place.

Following this period, we arrive at the stage of old age, Stages V to VI. Hellman's measurements show that growth still takes place in all three directions, but to a very much less extent than in former periods, in fact, in some places growth is negligible. However, these measurements prove that growth takes place at all ages. During this period, changes take place within the dentition. Teeth are more frequently lost, and the occlusal surfaces of those that remain are worn to a degree, so that the height of the interdental region shows a decline or degrowth, with the exception of the palate bone which increases in depth.

In the last stage, Stages VI to VII, or that of senility, most of the areas of the face show a further decline in size or degrowth. However, there are a few regions which still show an increase, or an absence of decline, and these are in the orbital, bicondylar and bigonial widths.

We have thus traced in a brief manner, how, where and why the human face changes or develops from birth to senility.

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THE ECONOMIC PROBLEM IN ORTHODONTIC PRACTICE*

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AT THIS meeting we have discussed the etiology, diagnosis and treatment of orthodontic cases. To me has been assigned the task of dealing with the economic problem. We shall agree that if we know the cause of malocclusion and if our diagnosis be correct, we should obtain better results from our treatment, and though we cannot expect always to achieve perfection, yet satisfactory results must be obtained in a large percentage of cases if we would hope to solve the economic problem—in other words we must be able to give value for the fee charged.

The problem of treatment is the same no matter where one practices. The same case requires the same treatment whether the patient lives in a large or small city. Whether the same treatment is given is another matter. The economic problem involved may be altogether different. Many of our members may have their practice entirely from the wealthy and possibly may be able to command fees which to another man would be entirely impossible. I am practicing in a comparatively small and by no means wealthy city. True, I have as patients those to whom the fee should be no serious consideration. The only trouble they have in paying is the trouble it takes to write a check. I also have patients who cannot so readily pay the fee, and likewise those who, in order to have the work done, must rearrange the family budget.

Therefore, in this paper nothing that is said may be of interest to those who are so fortunate as to draw their practice entirely from the wealthy. It is my hope, however, that something helpful may be said to those situated as I am. It is a fact that as the benefit resulting from orthodontic treatment becomes known, the demand for it is increasing, and indeed it may not be long until some means will have to be found by which all children, whether their parents are rich or poor, will be able to obtain such treatment.

In commencing the practice of orthodontia one has first to decide where to locate. In selecting the city, every one must choose for himself. This having been decided, the orthodontist should try to obtain an office in the finest building the city possesses. There may be differences of opinion as to which of the available buildings is most suitable, but the point I wish to make is that the best is none too good. In furnishing the office it is well to remember the effect of first impressions, and that in many cases the first impression is created by the reception room. This should be furnished attractively but not elaborately. The patients know that it is their money which is paying for it, and, while they expect and desire cleanliness and attractiveness, they should not be given an impression of extravagance.

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The office having been furnished, the orthodontist is ready to receive patients. As most of them are likely to be referred to him by general practitioners, he should send out cards announcing that he is practicing orthodontia exclusively at such an address. This card should state that he is a graduate of such a university and has taken special training at such a school. If the dentist is to refer patients to him, he has a right to know the orthodontist's qualifications. When the dentist sees the result of treatment in a few cases, he will refer or refrain from referring patients regardless of degrees held by the orthodontist. The orthodontist should also become a member of the local dental society and take an active part in its proceedings. He should not be an office seeker but should be willing to assume even more than his share of the work. He should likewise be conversant with the points of resemblance, and also of difference, between a business and a professional calling.

I have often seen it stated, generally in examination papers, that the difference between business and professional men was that the former were concerned only with the money side of the question, and that the latter did not consider it. I hesitate to believe that the business man is concerned only with the financial side of the transaction, and I certainly believe that the professional man cannot ignore it. It does not follow, however, that the professional man can conduct his practice along the line approved by the business man.

In one of the Herbert Spencer Lectures delivered at Oxford in May, 1928, on "Professions—Their Organization and Place in Society" by Professor A. M. Carr-Saunders, he makes the following statement:

"A profession may perhaps be defined as an occupation based upon specialized intellectual study and training, the purpose of which is to supply skilled service or advice to others for a definite fee or salary."

Further on in the same lecture he remarks:

"Again there is more of a parallel between the nature of the income of the fee-taking professional and of the manufacturer or dealer than is generally recognized. The income of the former is compounded of two elements and, put in the simplest form, consists of the amount charged for each service rendered multiplied by the number of services rendered. So, too, the income of the manufacturer or dealer consists of the turnover on each article manufactured or sold multiplied by the number of articles manufactured or sold. In other words goodwill, the extent of which depends upon the number of clients or of customers who can be attracted and held, is an important element in both forms of income. There remains, however, the profound distinction that manufacturers and dealers do, whereas professional men do not, buy and sell material goods as an essential feature in the performance of their functions. This distinction is so important that, however closely the organization of some professions may come to resemble business organization and however much specialized study and training in relation to these functions may come to be a characteristic of the manufacturer or dealer, there can be no transformation of the one into the other."

So we see that in one respect, the relation between the business man and his customer is the same as the relation between the orthodontist and his patient. The business man makes enough money out of his customers to pay expenses and

to give him that salary to which he is entitled. The orthodontist makes or hopes to make enough from his patients to pay expenses and to give him that salary to which he also is entitled. If you ask me what that salary should be I can only answer that: "Each one is entitled to that standard of living commensurate with his value to the life of the community he serves."

While this is true, it nevertheless must be recognized that there is a great difference in the handling of a customer and the handling of a patient. Unless this difference be clearly realized, the orthodontist will never solve the economic problem. He may try to solve it at the expense of his work, but the final result will be failure. When a customer goes into a store the merchant is free to sell him any article he wishes to buy. The article may be entirely unsuitable for him, yet it is his privilege to buy it. If we could speak in professional language, we might say that the customer could diagnose his own case and prescribe the treatment. The same man may bring his child to the orthodontist, but the relationship is not the same. Here the orthodontist has to tell the man what the child needs or even if he needs anything. Before prescribing treatment the orthodontist may, of course, consult with others, but they have to be his peers, and he, finally, must assume the responsibility of deciding the needs of the patient.

The orthodontist who extracts teeth because he believes that procedure to be the right method of treatment, may be commended; but the one who believes that the case should be treated without extraction, and then extracts merely because the patient asks him to do so, has sold his right to be called a professional man. He has let the patient diagnose the case and prescribe treatment. He has become an artisan and is deserving only of an artisan wage, apart altogether from the fact that he may be doing the patient a real injury. If the patient is to prescribe the treatment, why should he not also name the fee? The orthodontist who has not the courage to prescribe the treatment and to give such treatment or none, will draw his practice from the most unsatisfactory class of patients. His own morale will be lowered, and the high ideals which he had—let us hope—when he commenced practice, will fade away like the morning mists. On the other hand, the man who lets his patients know that his advice must be accepted, or that they can seek their treatment elsewhere, will draw his practice from those who desire the best—and who are willing to pay for it.

There is yet another distinction between a profession and a business. When a man enters, let us say, a store, and through any fault such as inattention, etc., fails to make a purchase, the merchant has suffered loss but possibly no harm has been done the customer. This is not so where the orthodontist is concerned. If, through any fault of his, the patient is discouraged from having treatment, not only has the orthodontist suffered loss, but in addition real harm has been done to the patient.

Some years ago I heard an orthodontist say that he never showed a patient or parent a model of before and after; his reason being that he never was sure that he could obtain a similar result. Now, in one sense he was right. We never know when we start treatment just what results we can obtain, but I do not believe that for that reason we should be afraid to show what results we have obtained in other cases. This is, however, not always necessary, and it is becoming

less needful all the time. Frequently I am told by parents that they do not wish to see any models as they knew so and so who had received orthodontic treatment and were acquainted with the results. Personally I do not object to showing models of completed cases; though I always make it a point to tell the parent that no honest man can guarantee results. I have sometimes been told that, if I would guarantee results, the patient would commence treatment. My answer invariably is that the only guarantee I make is to do my best; that the work is not just mechanical but involves the elements of growth, etc. One need not and should not impart to the parents the probability of failure, but, in fact, the likelihood of success. We should endeavor to be completely honest in our dealings, and while this will prevent us from guaranteeing results, it should also cause us to show the parents the result of neglect. Do not many of us who have been in practice for some years, know persons who are dental cripples, some of them already using artificial substitutes, who would not be in this condition if they had had proper orthodontic treatment when children? So far as we are concerned the sad part is that they were brought to us, but for some reason treatment was never undertaken. In such a case what degree of responsibility rests upon the orthodontist? It is evident that even in consultation he assumes a responsibility which is not placed, at any time, upon the business man. To say that he should sell orthodontia would possibly convey a wrong meaning, for there can be no seller without a buyer, and the orthodontist and patient do not meet in that relation. This, however, does not release the orthodontist from the duty he owes the child in using all legitimate means to impress upon the parents the benefit to be derived from treatment and the harm resulting from neglect, nor should he let the fact that he himself may profit financially influence him.

There are certain expenses which an orthodontist must incur. These include the rent of the office, telephone, magazines, and depreciation in furniture and equipment. He should have at least one woman assistant.

In buying operating material he need not be extravagant, but on the other hand he must have that which he thinks best, even though he might be able to obtain material cheaper from another manufacturer. This does not hold good in the selling of scraps. I have had the unfortunate experience of receiving for the platinium material therein over 25 per cent less than could have been obtained from another firm. This may be considered a minor matter and yet even in orthodontia the proverb holds, "Willful waste makes woeful want."

Here we might consider what help an orthodontist can or should have. I am not referring to the time when his practice has grown to such an extent that he should take a graduate as partner or assistant. I believe that where he is allowed by law to have the services of a dental hygienist he should certainly employ one. Unfortunately in the province where I practice a dental hygienist is not allowed, and all work at the chair must be done by the orthodontist himself.

All help employed, therefore, must be for the performance of other duties. The ways in which a capable woman assistant, for example, can be of service are so numerous that even to enumerate them would almost require a paper in itself. She need not be and, in my opinion, if only one is employed should not be, a trained nurse. When she has spent the years necessary to graduate as a nurse,

she does not take kindly to the different duties as a dental or orthodontic assistant. Nor need she be a very capable stenographer, though she should be able to type. If the orthodontist does his own x-ray and photographic work, an assistant can make herself increasingly indispensable by mastering the technic of taking these pictures as well as developing and mounting the same, and in this case it might be found real economy to have at least two assistants, one of whom should be a stenographer. Frequently one woman assistant with a part-time stenographer is the most economical arrangement.

The orthodontist cannot make as much use of a dental laboratory as those engaged in general practice. In my practice the only appliance made by the laboratory is the Hawley retainer, and for a time there was considerable difficulty in having these made as I wished, but after bringing the laboratory man to my office and showing him exactly what I wanted, the difficulty has been overcome.

If one permits it, the telephone can become a great time waster. Little Mary may want to know whether her appointment is four or four-fifteen, and seems to think it necessary to ask for the doctor to obtain such information. Therefore, the assistant should always ask who is speaking and see whether or not she can take the message. Time can also be conserved by arranging the appointments systematically. For instance, all long appointments should be given in the morning or occasionally in the early afternoon, after which short appointments for routine treatment or examination can be arranged. A second operating room greatly facilitates the handling of the shorter appointments. After finishing with one, the operator can pass into the adjoining operating room, wash his hands, have the second patient waiting for him in the chair while his assistant makes the next appointment for the first, cleans the operating table, etc., and places the third patient in the chair.

Most parents do not like children to miss school, and while it is absolutely necessary at times, we should seek to avoid it as much as possible. This formerly was a serious problem, but it is much less difficult now. The best way to approach it, in my opinion, is to tell the parents that while many short appointments can and will be given after school hours or on Saturday, it is impossible to arrange long ones at such times. To give one patient a long appointment would mean keeping a number out of school for short ones. Inform them that while your work is really not painful for the child, yet there is some work which might suffer if you tried to do it after school hours, when the little one may have had a trying day and you yourself were very tired and possibly "cranky." I have found practically all parents to be very appreciative of the merits of the last contention. Fortunately the school authorities have become convinced that children should be excused for dental work.

Let me say one thing further regarding appointments. Sometimes after discussing the case with the parents, telling them the need of treatment, and the danger of neglect, they will say in effect that Little Mary is so busy at school or with singing or dancing lessons, that they do not know whether they will have time for appointments or not; but that if the appointments can be arranged without interfering with any of the above activities of the child the work may be

started. The orthodontist who undertakes work under the above conditions is only laying up for himself an exceedingly great measure of trouble, and more likely than not, when the work is finished, if it ever is finished, the case will be classified among the nonsuccessful. These parents should be informed, politely but firmly, that orthodontic treatment cannot take secondary place to the above, and that while an endeavor will be made to give such appointments as are satisfactory; yet if a successful result is to be hoped for, the orthodontist must be the judge of when and how often he needs the patient.

It should scarcely be necessary to state that an accurate record of every visit and of the work done for the patient at each visit should be kept. All cancelled or broken appointments should also be recorded with the reason given for such cancellation. If the patient comes to the office after the time for an appointment and cannot be attended to, it is marked on the chart as "failed," but a note is made that the patient came too late. All instructions given to the patient during treatment, particularly when told to visit the family dentist, are also recorded and a note is made showing whether such instructions were given direct to the patient or to the parent, and whether direct, written, or by telephone. The possession of such a record may possibly save you a very unpleasant interview with parents later on. Where a patient is persistently breaking appointments, the parents should be informed of the fact, and if such inattention on the part of the patient is likely to interfere with success of the work, the parents had better be advised to discontinue treatment. If a failure results from noncooperation on the part of the patient, and the parents have not been informed during the course of treatment, I believe the orthodontist is to a large extent responsible.

The income tax law requires that an account of all income and expenditure be kept. Note of such items can be made in a separate daybook, if one wishes, but should finally be transferred to some such forms as Charts 1 and 2.

CASH

DATE	NAME	ACCOUNT	CASH	REMARKS

Chart 1

These sheets are designed for a loose-leaf system and all expenditures are shown under the various headings. With this system it is very easy to compare the expenditure for any one month with the expenditure for the preceding or any other month.

DATE	NAME	LAB.	DENTAL SUPPLIES	DRUGS	LIGHT GAS TELEP.	LAUNDRY	SALARIES	RENT	X-RAY	CHARITIES DONATIONS	TAXES AND INSUR.	SUNDRY	BANK	PERSONAL	FEE REM.
	TOTAL														
	GRAND TOTAL														

Chart 2

Chart 1 is of the same size but is for the receipts, and here the income for each month is recorded.

These charts not only keep the orthodontist informed as to his financial standing but give every satisfaction to the income inspectors. I have frequently been asked by dentists where they could be obtained, as they were advised by the government official to use them.

Let us now consider the income of the orthodontist. Can we or should we charge for consultation? This is a matter upon which, I believe, there is difference of opinion. Ethics is not involved. Just what do we mean by consultation? For instance, when we first see the little patient how much information can we give the parents? Possibly we can tell them the case needs treatment. Such information, however, may be of no value to them. They already know that. We can and should tell them the benefit of treatment and the result of neglect, but I submit we can at this visit only generalize, and we should approach the patient or the parent in some such manner as the following:

"Mrs. Smith, to tell you that this case needs treatment is to tell you something that you already know; but to outline a treatment, to give you even an estimate of time required will require further study. Of course I could guess at a lot of things, but I do not want to do that, nor do you wish me to do it. To give you any real advice which will be of service, I will require models, a full mouth x-ray examination, and a profile photograph of the child [if you so require]. Now, for the reason that I can give you at this time so little real information regarding treatment of this case, I am charging you no fee for this visit. With your permission I should like, however, to do as I have outlined. Then I can give you advice which will be of value and my fee for such will be so much."

If one does not take x-rays oneself, the fact should be made clear. Most parents want to know why they are necessary, but a demonstration from a few pictures will easily convince them. Personally I believe this to be a good method of approach. If the parents do not agree, we have wasted but little of our time, while if we went ahead and took impressions, x-ray pictures, etc., we should generally find that those who did not proceed either refused to pay or paid under protest.

To my mind every means should be taken to have a complete understanding with the parents before commencing treatment. They should be given an estimate of time, making sure that they understand it is only an estimate; the fee should be discussed with them; the appointments necessary, the care of the teeth during treatment, the diet, and any other matters which one may deem essential.

Let us consider a few of these items. First, as to the time necessary for treatment, I am free to admit both to you and to my patients, that the longer I am in practice the less sure I am of the length of time a case will take, and I like to make this very clear to the parents.

Next as to the fee. Just how should this fee be arrived at? Should it be based on value received? If so, what is the value received by a young child, considered stupid by her teacher, and occupying the foot of the class, who after orthodontic treatment, by having her self-confidence, if you will, restored, soon established herself at the head of her class—a position which she maintained throughout her school life? Or how would you arrive at the value of orthodontic treatment to a young

lady, who, though an honor graduate of a collegiate institute and of a leading business college, on account of her appearance could not obtain a permanent position or hold very long a temporary one, when after successful treatment she has easily secured and held a good appointment? Can the service always be paid for according to value received? We know it cannot.

Shall we then base our fees upon the time spent in treatment of the case? Frankly I do not like this method nor do I believe it appeals to the majority of parents. If they know the fee is based on time, they object, and rightly object, to a moment being wasted; and yet we know that in working for children, we often have to spend many minutes which, though far from being wasted, yet may appear to be so to the parents. It also causes them to place the orthodontist in the same class as all "time laborers."

While both service and time enter into the fee, yet service must predominate. It would be entirely out of place for me in this paper, to discuss the amount of the fee. Each one will have to decide that for himself. We might, however, discuss the advisability of whether it should be a fixed charge or otherwise. I believe that some orthodontists do charge a fixed fee for the case as surgeons do. To my mind, however, the analogy is faulty. When a surgical operation is required, the surgeon's fee is often but a small percentage of the cost to the patient. Hospital, nurse, anesthetics, and a number of other charges are all extras; whereas in orthodontic treatment, the fee covers all. Besides the time element is a very minor consideration with the surgeon.

I did at one time make a fixed fee, but when I discovered I was getting only the same fee for the case which took twice as long as I had expected, I came to the conclusion that it was not fair either to myself or to some of the patients. I next tried giving a fee for placing the appliance and then a monthly fee according to work done during the month. Possibly this may be the most ideal way, but it was too ideal for my practice. When I got through explaining why my account for one month was greater than that for the preceding month, I decided that either this system was at fault or I did not know how to apply it. I then gave a minimum and a maximum fee. This I found to be a better system than any I had previously tried, but now I think I have one still better.

When the child is very young and it is proposed to correct the malocclusion existing, the parents are informed that the fee covers only the present treatment, but that the child should be kept under observation until the completion of the eruption of the permanent teeth, and that during this period further treatment may be necessary.

It may also be remarked in passing that it is sometimes advisable to speak to the family dentist, advising him of the conditions and asking him to keep the case under close observation.

Where, however, the patient is of such an age that the treatment may be carried to conclusion without this period of watching, the case is studied and after talking it over in every detail with the parents before mentioning fee, I then inform them that this case may possibly be treated in a certain time—let us say a year, for instance—but it may take two years or even longer. Coming then to the question of fee, I mention my fee for the first year, for the second year so much, and so much

per month if it takes over two years. Practically in every case the fee for the second year is very considerably less than for the first year's treatment. The monthly fee for the third year is such that I would, from a financial standpoint, rather be through with the case—and the parents know this.

I have found that by this method I accomplish two things at least. In the first place, those cases which do not take over one year's treatment receive the minimum fee. For those which do take longer the parents realize that it is to the orthodontist's interest to complete the case as soon as possible. Let me give you an instance which will show what I mean. A certain case took many months longer than I had ever thought it would. More than once during the third year the father came in, as he said, "to laugh at me." "You know, Doctor," he used to say, "you certainly got ahead of me the first year or so, but I am getting it back now." Well in one sense he was right. I was able, however, to obtain his goodwill and cooperation during the whole period of treatment, and the total amount of the fee was such that if I had asked, or even suggested it to him at first, it would probably have prevented him from undertaking the work.

In arranging for payment of the fee, I have no hard-and-fast rule. When I state a fee for a certain period of treatment, that fee is settled. We cannot discuss the amount further with the patient. But we can try to meet his convenience in the payment. What practical difference does it make to me whether I receive 20, 30, or 40 per cent the first month, so much more in five or six months, and the balance at the end of the year, or whether I receive it in twelve payments? It frequently makes a great difference to the patient. In fact when you tell them you will try to meet any reasonable terms, they oftentimes seem to forget the sum in discussing methods of payment. Of course the yearly fee is all due during the year. If you tell the patient that in the first month you will have charged them with such a percentage, frequently you can have them pay most of that amount the first month. If not, try to meet their suggestions. Some patients do not like monthly payments, but personally I have come to prefer them because I find that where the accounts are paid monthly the patients keep their appointments better. I used to wonder whether this was just a coincidence, but I have decided it is not, for I have had my little patients tell me that "Daddy" checks up on them whenever he receives my account, and they did wish I would not send it every month. Where you know a patient to be untrustworthy, a large part of the fee should be demanded before commencing treatment. Where the fee is payable monthly, the statement should be sent the first of each month and the account should not be permitted to remain unpaid. During the second month they should be called on the telephone and politely asked for their check. If not paid then, a definite understanding must be obtained the first of the following month.

Let me here mention the subject of broken appointments. This arrangement in my opinion has also the advantage in that it takes care of broken appointments at least to a limited extent. It may be legal to make a direct charge for broken appointments, but I greatly doubt the advisability of so doing, as I know of nothing in financial dealings with patients to which they object more strongly, nor is there anything, short of gross incompetence or carelessness, that will cause more unpleasant relationship.

Under the system of a definite fee for a definite period, the parents know that it is to their interest to have the work completed in this time if it is at all possible, and, as I have referred to before, I have found that the patients keep their appointments better. I do not mean to say that in my practice there are no broken appointments, but they do not cause me the worry that they once did.

I have mentioned before the great importance of having a thorough understanding with the parents before commencing treatment, and in my opinion, where it can be avoided, their memory should not be trusted. I am in no way doubting the honesty of patients as I believe the great majority are as honorable in their dealings with me as I try to be with them, and yet in my experience, I have found it surprising how they can forget things which I have told them or at least obtain a different meaning from that which was intended to be given. It is my custom to send the parents a letter with a copy of the memorandum containing information given me by parents such as the age of patient, and the history of the case. I find it advisable to enclose this memorandum because the history given later does not always coincide with the history obtained at the commencement of treatment. With your permission I shall read you a copy of the letter.

Dear Mr.——:

As I promised you, I am enclosing a memorandum with reference to the case of your son —— which I believe is correct. However, should it be inaccurate in any particular, will you please communicate wth me at your earliest convenience.

This is a case that should be attended to immediately; the longer it is left the greater the possibility of failure, and as he becomes older the possibility of failure is much increased. If the work is commenced now, I believe we can, with your cooperation, obtain a satisfactory result.

No definite time can be stated for treatment. This will depend to a considerable extent upon how well —— keeps appointments and carries out such instructions as may be given from time to time. Please see that he is particular about keeping his teeth well brushed and clean. This may be more or less difficult with the appliance in place, but it can and must be done, otherwise undue tooth destruction may result from decay. May I impress upon you the great necessity of —— keeping appointments regularly. An endeavor will be made to give such appointments as are agreeable to him, but if I am to hope to obtain a satisfactory result, I must be the judge of when and how often I need the patient. To avoid undue breakage of appliances, please see that he does not eat hard or sticky candy, as I have found this the greatest cause of appliances breaking.

Your attention is invited to the financial agreement entered into which in brief is as follows: The fee is to be $—— for the first year, payable as follows: (Arrangement of payment is here given). In the event that the case should require attention beyond the period of twelve months, then a fee of $—— will cover the second year's treatment, payable monthly, and in the further event that the case should require attention beyond the period of two years than a fee of $—— per month will obtain until the completion of the services required.

May I suggest to you that the above fee arrangement is entered into as a matter of convenience, and the payments per month are not necessarily predicated upon the number of calls or amount of attention during any one month, but rather are determined so as to apportion the obligation monthly as a convenience.

To complete my records as to your understanding of the arrangement, and also that you may appreciate the necessity of cooperation on the part of yourself and —— I am enclosing a copy of this letter which I ask you to sign and kindly return to me for my clinical records. With you this is not necessary, but still I would appreciate it.

I want to assure you that I shall give this case my very best attention and would be pleased to have you or Mrs.—— accompany —— at any time that you desire.

Yours very truly,

Of course, it may be necessary to mention other factors. For instance, when the patient is very young, it is stated that the fee covers only a certain period of treatment, after which the case will have to be kept under observation and treatment given if and when necessary. Again, where a tooth is missing and it is decided to have it replaced by bridgework, this fact should be mentioned. The information should be conveyed to the parent that this work should be done by the family dentist; as otherwise you may occasionally find that the parents understood that this work was included in the orthodontist's fee.

There is another letter which I write to parents when the occasion demands, which is as follows:

Dear Mr.——:

I consider I have finished the active period of treatment for your son ——. The result obtained is, I believe, satisfactory, and I should like to express my appreciation of the cooperation received during treatment. Your boy was a fine patient.

—— has now the retaining appliances. This, for the upper arch, is removable by himself, and should be removed and cleaned at the earliest opportunity after every meal. It should be worn continually for some months, afterwards at night only, until it can be dispensed with entirely.

The lower appliance cannot be removed by him, but the teeth can be kept cleaned. I wish to keep —— under observation for at least a year, possibly longer, and want him to visit me about ——. There will be no fee for these visits. Should there be any further work to be done for which a fee would be charged, I shall consult you before commencing.

I shall be pleased to have you come with —— so that I may show you original models.

Sincerely yours,

In conclusion let me say that while it is good policy to discuss the fee and terms of payment with the patient or parent before commencing active treatment, they should never be given the impression that the orthodontist is chiefly concerned with economics. The one who obtains such an impression will immediately lose faith in the operator. Nor should this impression be given, for in no instance should it be true. The orthodontist is not concerned chiefly with the economic problem but rather with the treatment of the different cases so that each patient will receive the greatest possible benefit. The one who performs this service has taken the best means of solving the economic problem in orthodontic practice.

THE ADAPTATION OF CORRECTLY FORMED AND EFFICIENT INSTRUMENTS IN THE FIELD OF OPERATIVE TECHNIC*

HERBERT A. PULLEN, D.M.D., BUFFALO, N. Y.

THE day has long since passed when a multiplicity of instruments for use in orthodontic technic is considered a crime. Some of us can remember the early days when the sum total of the operative instruments of the orthodontist consisted of a gold file, a wrench, a pair of gold snips, and a pair of flat nosed office pliers. In the use and adaptation of the few ready made appliances of that period, the expansion arch and clamp bands, there was very little need for many more or better adapted operative instruments.

Today the appliance armamentarium of the orthodontist includes so many forms of appliances and parts which have to be assembled, adapted, or adjusted at the chair that the set of instruments above enumerated would be totally inadequate for modern operative technic. While it is desirable to reduce the number of needed instruments to a sane limit, no one would wish to bring back the days of paucity of instruments, for the same reason that one would not willingly recall the stone age when a few stone implements answered the simple needs of primitive man.

However numerous the instruments that are needed for modern operative technic, it is obvious that the forms of these instruments should be designed and fashioned according to the nature of their requirements.

To this end I have indulged a natural liking for designing and adapting special instruments for performing the various simple or complex mechanical operations at the chair with the idea in mind of simplifying and improving the technic by the attainment of correct and efficient forms for such instruments.

In this presentation of a number of correctly formed and adapted instruments either of my own or another's design I trust that you may share my interest and enthusiasm in the analysis and attainment of the correct forms as related to the requirements of these instruments.

These requirements may be enumerated as follows; first, the design of an instrument which will secure the most natural and restful positions of hands, arms, and body in its use; second, directness of application if possible; third, positiveness of control; fourth, the reaching of apparently inaccessible places in the mouth; fifth, universal application, i. e., to either side of both dental arches; sixth, the attainment of results with the least number of motions; and seventh, the saving of time.

Natural and restful positions in the use of instruments at the chair presuppose such positions on the part of both patient and operator, the height of the chair governing the rest positions of the body, and the arms, wrists, and hands in the manipulation of these various instruments.

*Read before the Pacific Coast Society of Orthodontists, San Francisco, February 18, 1932.

Generally speaking, there are needed but two positions of the chair in regard to height in all instrument manipulation in operative technic, these positions varying as to whether the operation is in the mandibular or maxillary dental arch.

For the natural and therefore correct positions of the arm and hand in holding instruments for the technic in the mandibular arch, the chair height should be so adjusted that the tip of the patient's chin is on the same level as the horizontally extended forearm of the operator, i. e., the top of the forearm.

Whether the operator stands at one side or faces the patient, the right arm of the operator, as well as the right hand and fingers in holding any of the various instruments, will then be in the most natural and restful position for instrument manipulation in the mandibular arch.

For similarly correct positions for operating in the maxillary arch, the chair height should be changed so that the head of the patient is halfway between the operator's elbow and shoulder.

These two changes in height of the chair are but a few inches apart, and are quickly made, as well as any intermediate positions which might be found necessary in order to obtain a more natural pose in operating, or to gain a clearer view of the field of operations, or to reach more easily an unusually inaccessible place in the mouth.

The orthodontist's chair should be a child's chair which is so fitted to the child that its back, head, arms, and feet can be made comfortable in a relaxed position while the operator works; none of which is possible when the child is placed in an adult chair.

In playing golf one has to assume a stance, a certain position of the feet relative to each other and to the ball in order to preserve body balance and make the most effective stroke with the golf club, at the same time being restful and relaxed during the entire golf stroke. Likewise, in operating at the chair, the operator should assume a stance which will allow him to be relaxed and balanced in the body movements so that he can the most naturally and easily handle the various instruments. The body should be erect, the feet close together with the weight equally balanced on each foot, with the operator at the side of and partly facing the patient in order to effect such a stance.

Beginning with these relative natural positions of patient and operator and chair height, the instruments should be built or constructed from the ground up, so to speak, so that the angles of inclination, the shape of the handles, and the working extremities of these instruments will be directly related to the definite positions of the operator at the chair.

With this in mind we can proceed to an analysis of the various kinds of instruments used by the orthodontist and describe the forms which they should assume to perform best the work required of them. We shall find that these instruments may be divided into three general classes; those instruments held in the palm of the hand and controlled by the fingers and thumb, like the plier; others held somewhat similarly but controlled by the thumb, such as the burnishers and band adapters; and those held almost entirely in the fingers and controlled by them, including labial and lingual arch removing instruments, wrenches, et al.

The instruments of the first class, the pliers, are the most used and most numerous in operative technic, so that it has become largely a plier technic, and a description of the various types of pliers and their particular forms as related to the work required of them is our next consideration.

In general pliers should have a uniform and definite length of handle, 3.5 in., a nose length according to the distance inside of the mouth it needs to extend, upward or downward bends and curves for accessibility to certain locations, as well as for proper angulation of the plier for natural positions in holding with the hands.

The width between the handles at the widest portion should be 1⅝ in., so that the plier will retain a firm contact with the palm and fingers in its closed po-

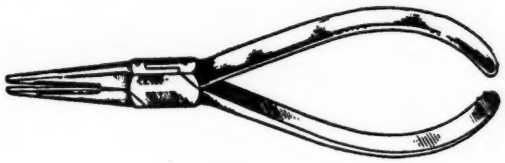


Fig. 1.

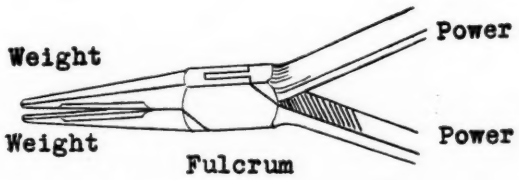


Fig. 2.

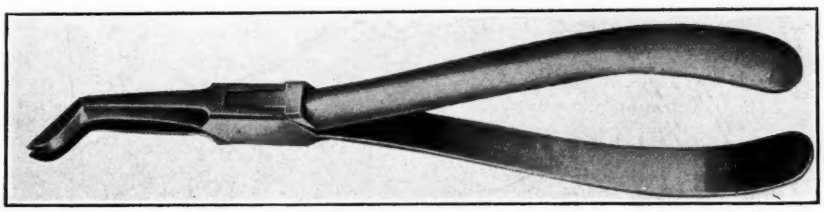


Fig. 3.

sition. The ends of the handle should have thickened rounded extremities for comfort.

One of the earliest forms of pliers, the plain flat beaked office pliers, I refashioned in 1908 for use in bending arch wire on its rounded surfaces, Fig. 1, and for twisting wire ligatures in a direct line from the ends of the rounded beak. Being unserrated it would not nick or mar the ligatures so that they would break at a nicked part. After twenty-three years this plier is still the most used in a long list of useful pliers.

The mechanical principle of the plier is that of a pair of levers of the first class, Fig. 2, using the same fulcrum at the joint, and with the weight arm of one beak antagonizing the weight arm of the other, providing tremendous power with little effort.

Instruments design and fashion themselves according to the existing requirements as observed by the maker of any special instrument. This will be

noted in the description of a number of properly formed pliers and other instruments which are here illustrated.

For example, the incisor band forming plier, Fig. 3, not only adapts itself to the palm of the hand in length and width and curve of its handle, but when held in the hand with the arm in a restful position not lifted at the elbow, the curve of the nose of the plier follows the labial curve of the maxillary incisor teeth, as at *A*, Fig. 4, when the chair is adjusted so that the head of the patient is at a height halfway between the elbow and shoulder of the operator.

Again when the chair is slightly lowered to the position for mandibular operating, the convex portion of the beak of the band forming plier is most per-

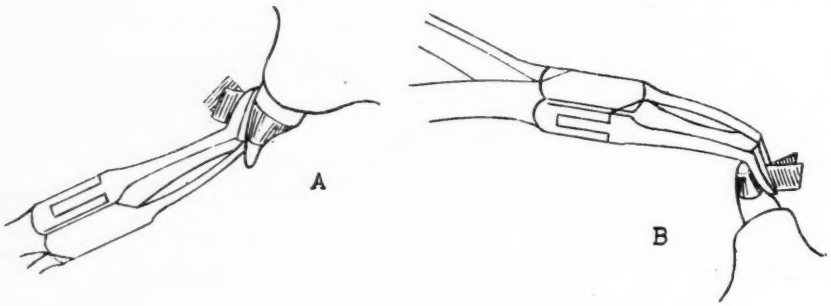


Fig. 4.

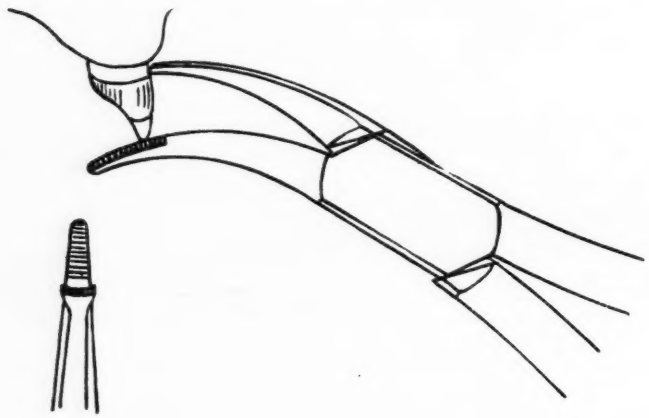


Fig. 5.

fectly adapted for pinching band material on the lingual surface of the mandibular incisors, Fig. 4 *B*. The angle of inclination being correct, the curve of the beak must naturally follow the labial and lingual curves of incisor surfaces in the proper posture of body and positions of arm and hand.

A plier may be used to apply great power at a given point or plane with the least number of motions expended, with the least effort, and with the greatest comfort to the patient. For example, in removing the incisor or canine seamless band, great power must be delivered upon the gingival edge of the band, while the incisal edge of the tooth must be protected.

The design of the incisor band removing plier, Fig. 5, is new, but it meets all of the requirements of power and protection, proper angulation and curve

of beaks, a soft tin surface on one beak to contact with the incisal edge, and a widely curved and sharply beveled edge on the other beak for engaging the gingival margin of the band.

Occasionally it is necessary to slit an incisor or a canine band in order to remove it, and the Case band slitting plier, as shown in action in Fig. 6, is especially designed for this purpose and is a valuable addition to one's list of useful pliers.

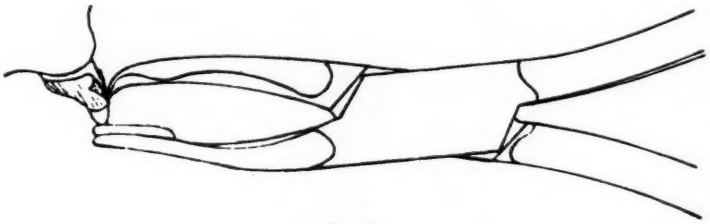


Fig. 6.

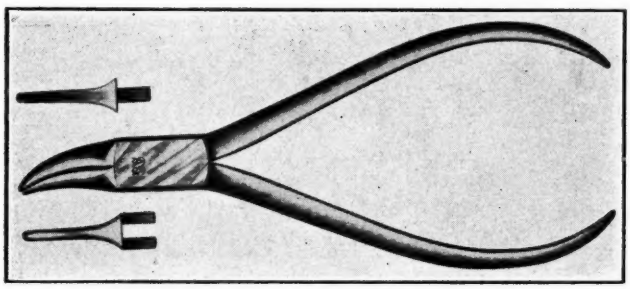


Fig. 7.

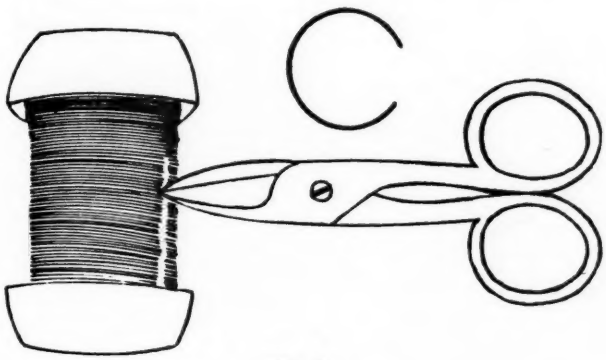


Fig. 8.

For contouring the margins of plain or seamless incisor or canine bands the smallest contouring plier, Fig. 7, adapts itself most perfectly with its narrow canary beak.

A more perfect technic for separating anchor teeth before adapting anchor bands consists in the use of short circular sections of separating wire cut on the spool of wire and left thereon until needed for use when they can be removed one at a time, Fig. 8. Grasping the circular section with a refashioned surgical needle holder, Fig. 9, enables the operator to borrow an idea from surgery in threading the separating ligature wire between the teeth following a curve, which prevents

the ligature from injuring the soft tissues, a suggestion of Dr. Spahn's. The needle holder is self locking with a slight pressure on the handle so that the threading of the separating ligature is very positively done.

The ligature is again grasped by the needle holder plier and continuously twisted while it is locked until tight enough, when the needle holder plier is un-

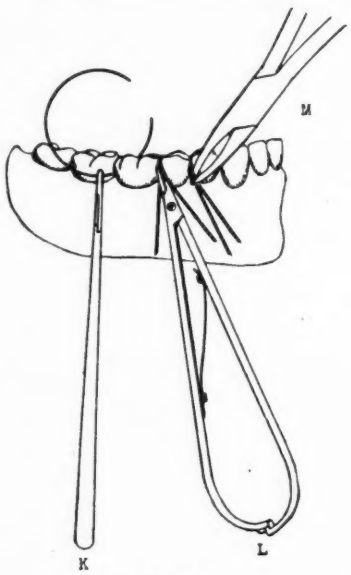


Fig. 9.

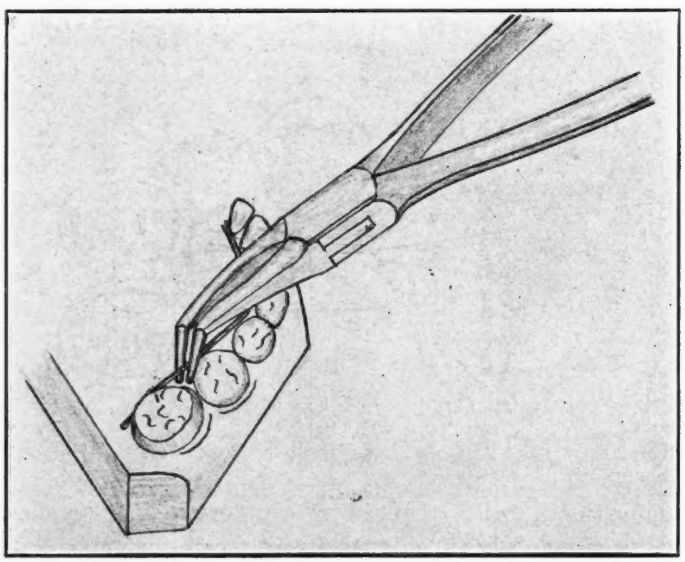


Fig. 10.

locked by a slight pressure on the handle, and the excess wire cut off with the Angle ligature cutting plier, as shown also in Fig. 9 in action.

This needle holder plier is made with a narrow rounded nose which will rotate in the buccal embrasures without injuring the gums, and has flat unserrated beaks. It will also be found useful for placing and twisting ligatures of stainless steel on anterior teeth.

A round nose plier with the extremities offset from the shank of the plier, Fig. 10, adapts itself comfortably to the bending laterally of the lingual arch wire when necessary.

The adaptability of a plier is the best test of its efficiency and popularity with the operator who is appreciative of the value of a correctly designed instrument.

In the molar band technic, especially in the direct method of adaptation using seamless bands, there are a number of pliers which seem to be admirably adapted to the various steps.

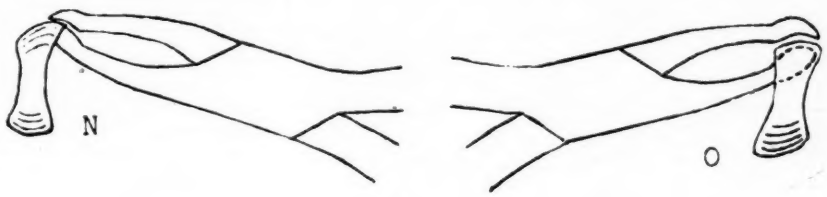


Fig. 11.

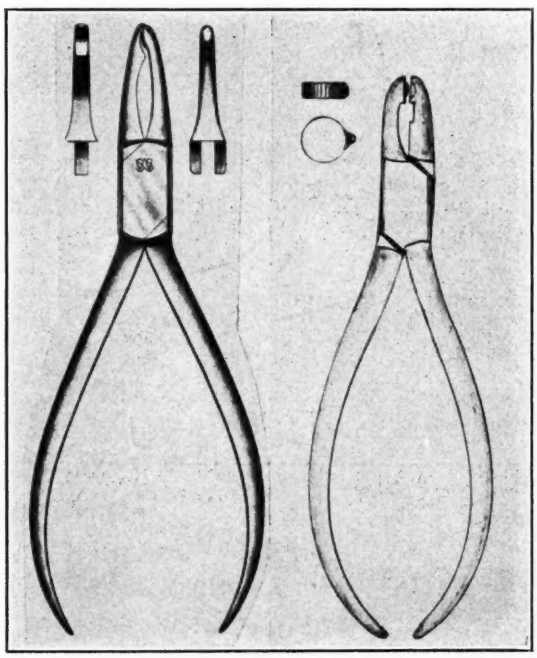


Fig. 12. Fig. 13.

For example, in contouring the margins of the seamless molar band, *N* Fig. 11, I have found that the form of contouring plier illustrated answers all of the requirements of margin contouring as well as bellying out the center of the lingual surface of the band as at *O*, this being desirable in order to keep the lingual lock attachments from too close contact with the gingival gum tissues. This is a stock plier of the SS. White Co., No. 114, Fig. 12.

Fig. 13 illustrates a plier especially designed for pressing a rounded elevation on the lingual surface of the molar band just large enough to seat the half-round vertical tube in relief. Fig. 13 exhibits the beaks of this plier partly open

and beneath a molar band with the rounded eminence in relief, and another with the half-round tube soldered on this eminence. This is a step in advance in the way of preserving the health of the gingival tissues by preventing the encroachment of the half-round tube or lock upon these tissues.

For indenting the buccal and lingual grooves on the seamless molar band I have adapted a plier, S. S. White No. 211, Fig. 14, with male and female beaks

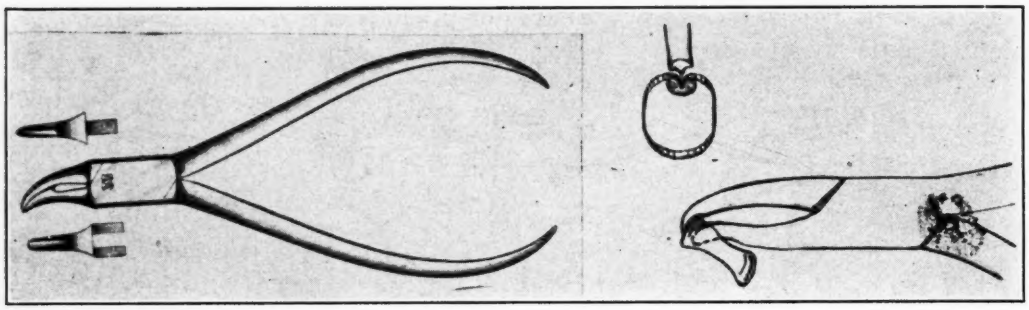


Fig. 14.

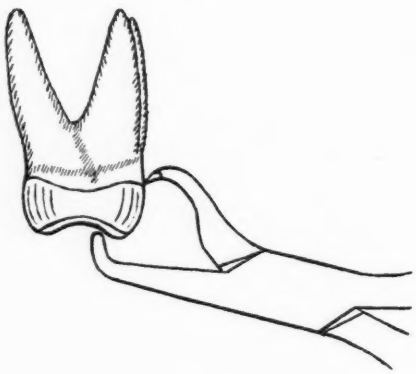


Fig. 15.

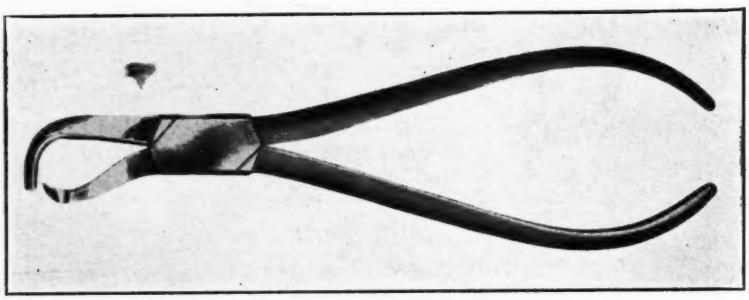


Fig. 16.

which will deepen these grooves after they are first outlined with the band adapter in the preliminary adaptation of the band.

Pliers should be so fashioned in length and curve of beaks that they will reach the most inaccessible places in the mouth where the power of a plier is needed, thus rendering it easy for operator as well as patient in the performance of otherwise difficult operations.

Fig. 15 exhibits a molar band removing plier which reaches far enough distally with proper bends and curves to allow it to engage the gingival margins of the band, first in the embrasures, and then at other points, so that the band is easily removed. Fig. 16 exhibits this plier as it was originally designed many years ago, its form not having been altered in any way since.

Occasionally a seamless molar band will require stretching in order to fit the molar more perfectly at the gingiva, and the Taylor band stretcher, Fig. 17, adapts itself very nicely to all sizes of bands from incisors to molars.

Instruments should be available for unexpected emergencies, such as the breaking off of the half-round rod in the tube on the molar band in the mouth. Such an instrument in plier form is shown in Fig. 18 in position for forcing the half-round rod from its position in the tube.

The labial and lingual arches anchored to molar bands by the half-round rod

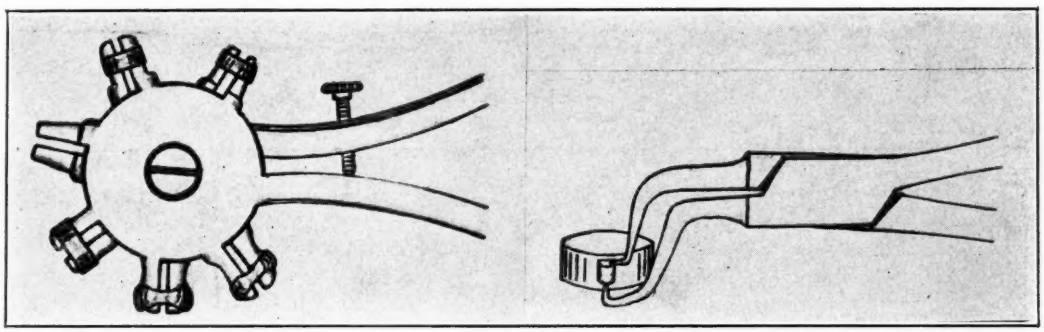


Fig. 17.

Fig. 18.

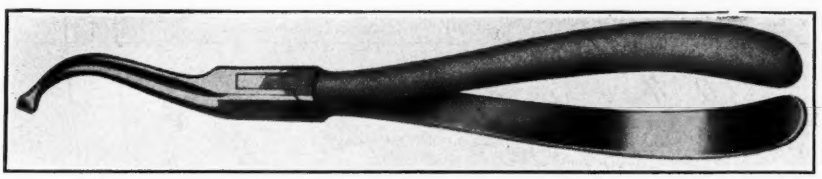


Fig. 19.

and tube anchorage require a special group of instruments of various patterns and designs according to their need of placement or removal, of bending, twisting, et al.

Fig. 19 illustrates a lingual and labial arch lock seating plier which grasps the lingual or labial base wire above the half-round rod firmly and seats the lock with ease and precision. The neck of the plier has a double curve to make it equally applicable to either maxillary or mandibular arches on either side of the mouth, thus being universal in operation. This curve, together with the extra long handle, facilitates reaching the most inaccessible places in the lingual portion of the mandibular arch.

The secret of the power of this plier lies in the grooved inner surfaces of the beaks, Fig. 20. Horizontal grooves located just above the lower edges of the beaks make it possible to grasp the arch wire with tremendous force. A vertical groove at right angles to the horizontal groove on each beak forms an embrasure

for excess solder and further prevents slipping when inserting the half-round rod in the tube.

Fig. 21 exhibits the use of this arch lock seating plier in seating the half-round rod of the labial arch in the vertical buccal tube.

One of the exasperating things that occasionally happen is the tightness of the fit of the half-round rod in the vertical anchorage tube requiring an instru-

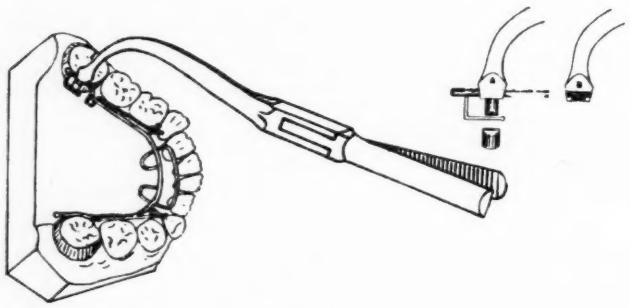


Fig. 20.

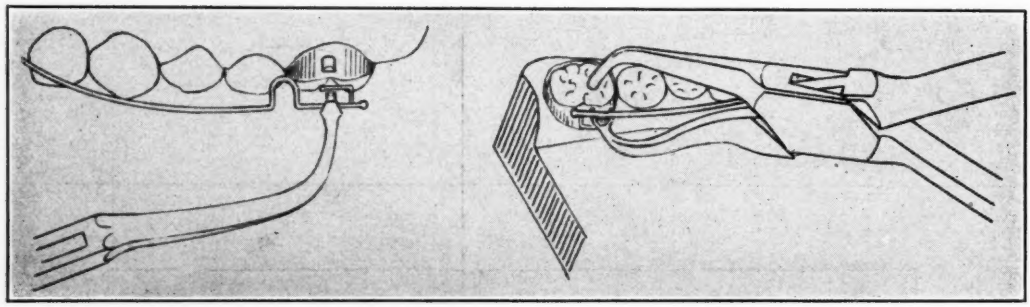


Fig. 21.

Fig. 22.

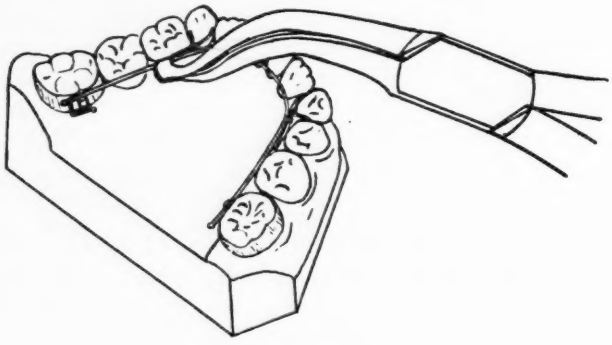


Fig. 23.

ment of great power to remove it. To accomplish this operation easily I have designed an arch lock removing plier, Fig. 22, which applies vertical lifting power on both sides of the lock at the same time and easily removes the half-round rod from the tube.

Not infrequently the lingual arch becomes bent downward in the maxillary arch or upward in the mandibular arch and has to be bent into position while in

place, and a specially formed plier, Fig. 23, with a long curved shank dipping downward to flat nosed beaks which are needed to firmly grasp the lingual arch and bend it to place.

In Fig. 24 is illustrated the use of two interlocking pliers for torsion of the arch wire in the region of one of the pins.

To this list of pliers one might add many others, but I think that I have

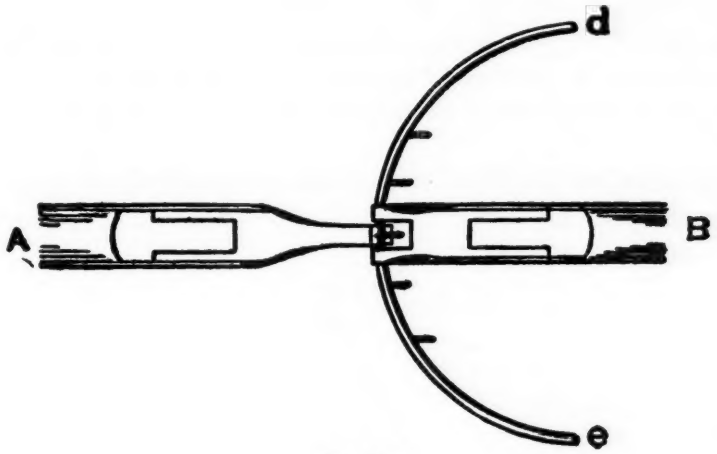


Fig. 24.

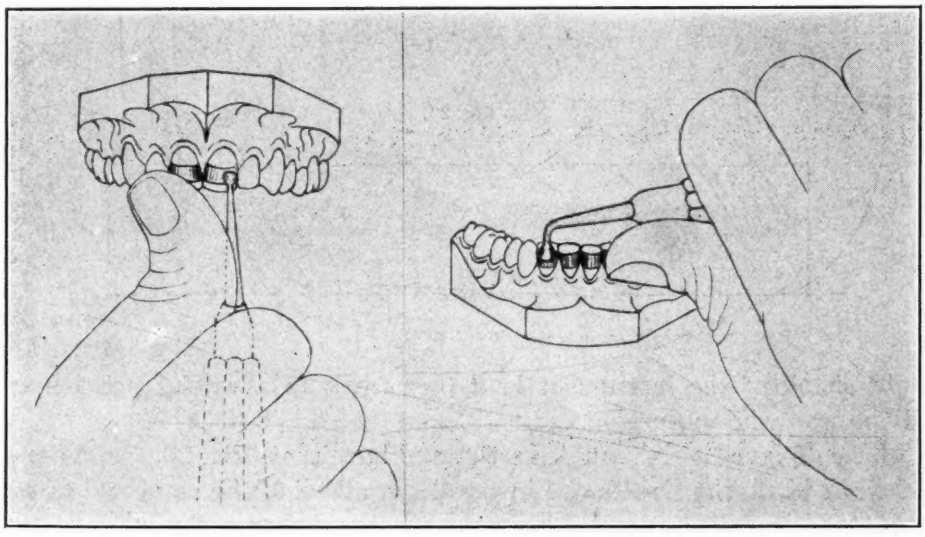


Fig. 25. Fig. 26.

shown enough of them to illustrate the advantages of specially designed pliers for every technical operation in orthodontia where they can be of service in securing greater accuracy and positiveness in the delivery of power with the least number of motions and amount of effort expended, and in reaching otherwise inaccessible places.

To consider next the instruments of the second class, those held in the palm of the hand but controlled by the thumb, i. e., the thumb is rested on nearby teeth

during the use of the instrument as a guard against slipping, there are several things that should be taken into consideration in the design of the working parts and handles and their relation to the delivery of power with rest positions of hands and arms and to safety in operating.

Band setters and burnishers should be made in cone socket extremities with large hexagonal handles which can be gripped in the palm of the hand better than the small handled instruments. Fig. 25 illustrates a maxillary incisor band setter and burnisher which has a grooved edge for forcing the band to position, a concave surface on one side and a convex on the other for burnishing the labial and lingual surfaces of the band respectively. The large hexagonal handle affords a firm palm grip allowing the use of the thumb as a guard on the nearby incisor teeth.

The angulation of the neck of the maxillary incisor band setter and the

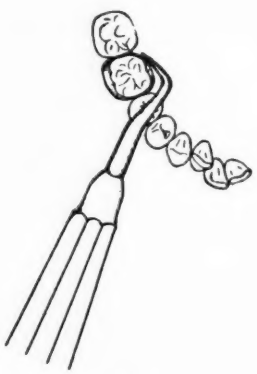


Fig. 27.

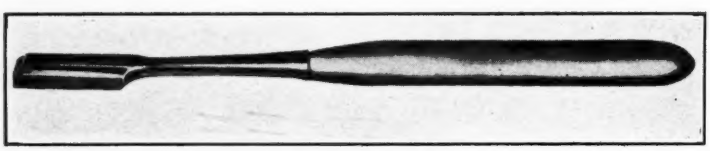


Fig. 28.

straight shank of the instrument lend themselves to a restful position of the hand and arm while in use.

I have designed a right-angled setter and burnisher, Fig. 26, for the mandibular incisor band, the right angle in the shank allowing the hand and arm to be in a rest position, the thumb having a guard rest on the nearby incisors, and the concave face of the burnisher in proper position for accurate burnishing.

In designing a burnisher or adapting instrument for the molar and premolar band a double concave surface is necessary at the extremity to allow of either a pull or a push pressure on the various portions of the gingival margins of the band as illustrated in Fig. 27. Proper angulation is secured by the double bends in the shank of the instrument, while the large cone socket handle assures a firm grip and plenty of power for burnishing, and a thumb guard in most of the positions in which it is used.

The molar band setting instrument, Fig. 28, although designed by me many

years ago, has been improved by having the handle made larger for securing a firm palm and thumb grip and longer for greater adaptability in use.

Fig. 29 shows the palm and thumb grip on this instrument in forcing a mandibular seamless molar band to place, the soft tin working surface engaging the occlusal margins of the band while a downward rocking pressure is exerted. The band setter may be turned on its edge to engage more closely the mesial and distal occlusal margins of the molar band with the tin surface in forcing the band to place.

Fig. 30 illustrates the Young band adapter in use in a large cone socket handle for securing a firm grip with the palm, allowing the thumb to rest on various teeth as a guard against slipping.

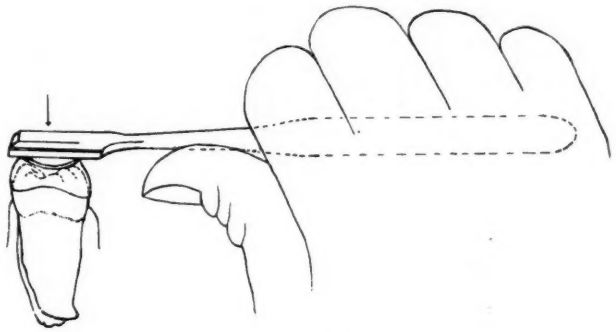


Fig. 29.

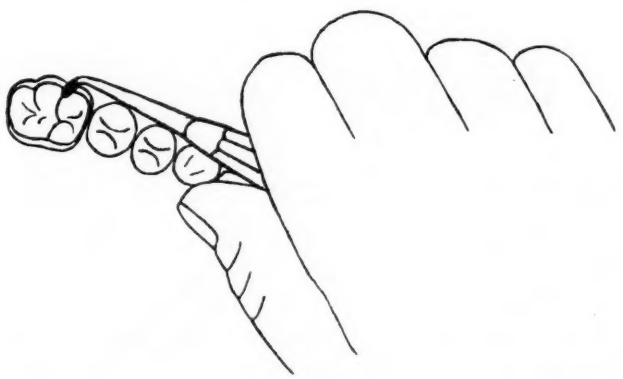


Fig. 30.

The third class of operative instruments held by the thumb and fingers only, where delicacy of touch rather than power is needed, may be illustrated in the use of a thin edge burnishing instrument, Fig. 31, feeling the depth of the gingival pocket before adapting the molar band, the index finger acting as a guard.

Fig. 32 exhibits another instrument of this class adapted for unlocking the anterior locks of the pin and tube appliance. It is offset at an angle for correct adaptation and presents at its extremity two hooked arms which grasp the arch wire on both sides of the tube, thus exerting equal pressure on both sides in removing the half-round rod from the tube without binding. The thumb may be used as a guard or support on nearby teeth while the instrument is in use.

The most important instrument of this class which I have designed is the lingual and labial arch removing instrument, Fig. 33, which is intended for unlocking and removing the half-round rod from the tube in either the lingual or the labial arch lock.

Fig. 34 exhibits the use of this instrument with the finger and thumb grip, the finger guard on the teeth, and the hook grip on the arch wire, which, on ac-

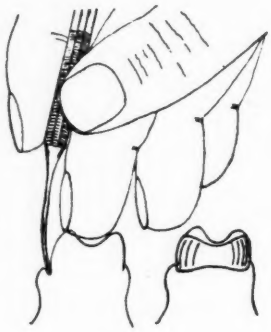


Fig. 31.

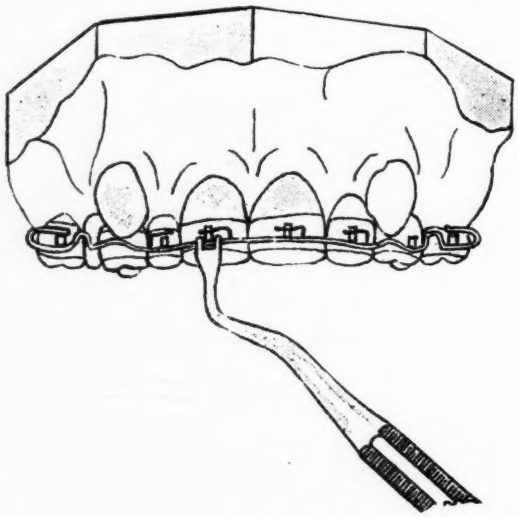


Fig. 32.

Fig. 33.

count of its nonslipping, enables the arch wire to be unlocked and removed without any lost motion and with the greatest comfort to the patient.

The angles of inclination of the bends in the shank of the instrument have been carefully worked out so that the hand and arm are in rest positions during use. It is universal in its use and is a companion instrument to the arch lock seating plier in the technic of the lingual arch or the labial pin and tube arch.

The instruments for constructive technic in the operating room, which technic is closely related to the operative technic at the chair, should have an equal degree of adaptability for the purposes for which they are intended as well as an equal degree of efficiency.

Soldering bands and attachments thereto, auxiliary springs and half-round rods to base wires, and repairing appliances constitute the bulk of the constructive technic in the operating room, and the greatest difficulty encountered in this work consists in holding these parts in correct approximation during the soldering operation as well as applying the flame at exactly the right point in sufficient intensity to fuse the solder.

It is possible to do this with heavy makeshift instruments, but these are usually of too great bulk and are inefficient and unsatisfactory. In order somewhat to standardize this technic I have designed a series of automatic soldering clamps, Fig. 35, made of 18 gauge (B & S) wire with clamping extremities formed

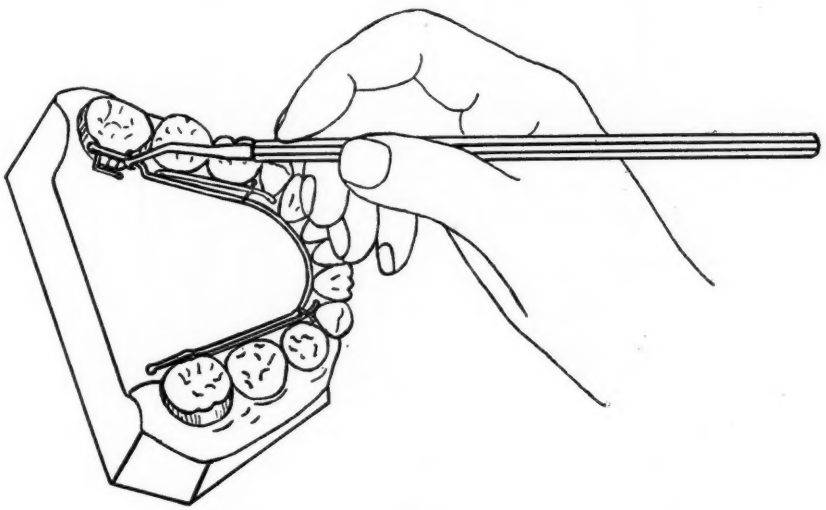


Fig. 34.

to hold in approximation the various parts to be soldered in the blowpipe flame with the loss of the least amount of heat through the clamp arms. The holding extremities should when possible be the ends and not surfaces of the wire, as shown at *A*, Fig. 35, being a clamp designed for holding the pinched ends of an incisor band in approximation while soldering.

The clamp shown at *B*, Fig. 35, holds a round or half-round tube in position on an incisor band while being soldered. The clamp at *C* makes use of the wedge principle in holding firmly a molar band, while the clamp at *D* holds the half-round tube in position on the band during soldering. The clamp at *E* automatically holds a horizontal buccal tube against the molar band as the solder is fused between them.

Fig. 36 exhibits a clamp for holding the horizontal tube in approximation with the molar band requiring less heat than the last clamp shown because of the clamp wire not passing through the tube.

Fig. 37 illustrates a clamp for holding the McCoy tube on the surface of an

incisor band while being soldered. Here, again, the extremities of the clamp wire touch the tube and band at points only, thus allowing the flame free access to the parts to be soldered, and carrying away the minimum amount of heat in the operation.

After losing a great deal of time uncoiling wire solder, cutting it off in six inch lengths, and straightening it as best I could, I finally persuaded the manufacturer to deliver it in six inch straightened lengths in 0.020 in. and 0.030 in. diameters, Fig. 38. In order to have these lengths always assembled I designed

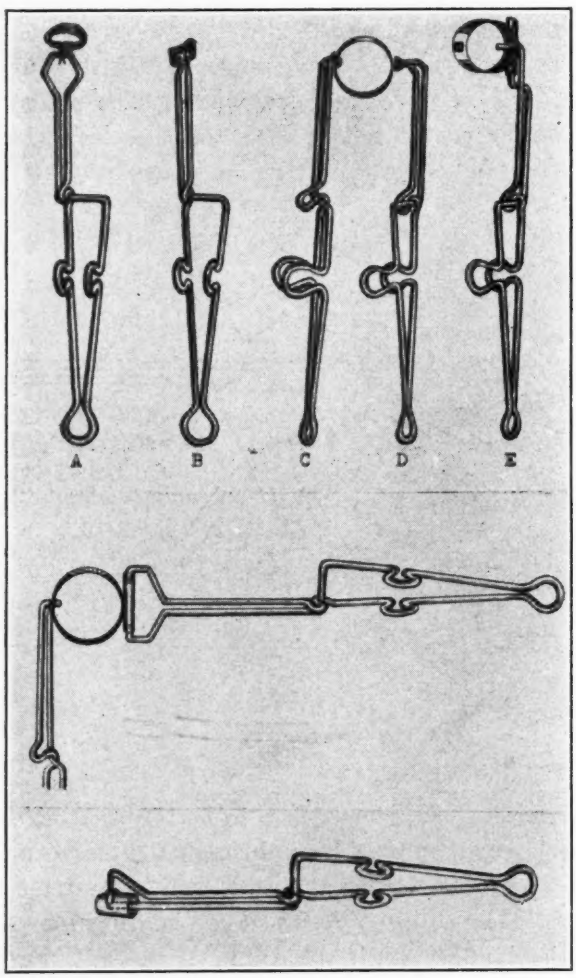


Fig. 35.

Fig. 36.

Fig. 37.

a self feeding soldering pencil, Fig. 38, the barrel of which contains a considerable number of these lengths of straight solder wire and automatically feeds one length at a time.

One of the hand soldering operations which more often than not has proved inaccurate because of imperfect alignment is that of soldering the half-round rod to the base wire for the Mershon lock for either lingual or labial arch locks. Again, the half-round rod is usually cut off with cutting pliers at a guessed length or distance from the base wire, filed down to finish, and is liable to be too long or too short when tried in the half-round tube. Cutting off the half-round

rod with heavy pliers also tends to flatten the rod so that it does not accurately fit the tube.

In order to overcome these defects I have designed a soldering jig of stainless steel, Fig. 39, which automatically feeds partially cut lengths of the half-round rod at right angles to and in approximation with the base wire, and in otherwise proper alignment during the soldering operation.

The half-round rod is partially sectioned in 0.10 in. lengths so that a touch of a cutting plier will complete the cut without distorting the shape of the rod, or a thin edge carborundum disc on the side of the rod opposite the section will answer the same purpose.

The partially sectioned half-round rod is made in six inch lengths, and can be fed up to the base wire until the last one is soldered, so that there is no waste.

By reversing the base wire the right or left ends may be placed in the jig for attachment of the half-round rod.

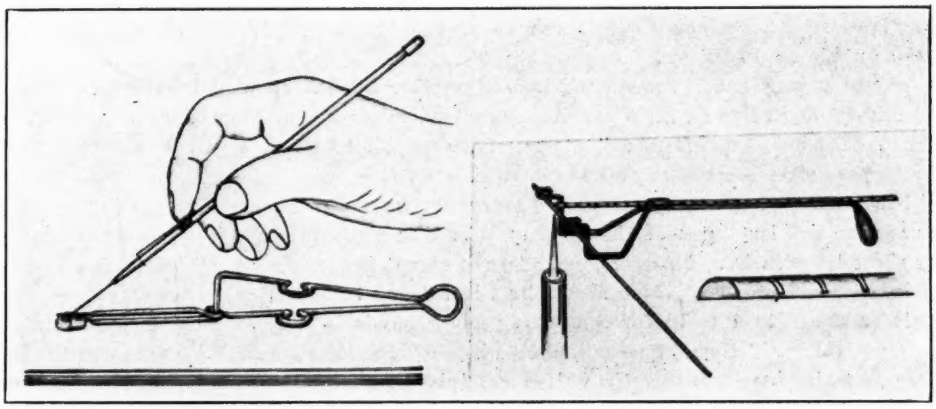


Fig. 38.

Fig. 39.

It is not my intention in the designing of an instrument of this kind to discourage hand soldering, for there will always be enough of it to do in cases in which a machine-like jig could not be adapted, but in soldering the half-round rod to the base wire where great accuracy is demanded, the precision and accuracy of the machine-like adaptation of a jig of the kind illustrated is of great advantage to the careful technician.

The value of such carefully designed instruments as I have illustrated is incalculable, representing many years of effort to improve my own operative technic, and while some of them may be thrown into the discard with the changing technic of the years, many will remain to enable me, and I trust others to whom I have the pleasure of describing them, to operate more easily and efficiently, with the fewest number of motions and the minimum of time.

DISCUSSION

Dr. H. L. Morehouse.—Before entering upon the discussion of this paper, I wish to make it clear, not only to Dr. Pullen but to the rest assembled, that any criticisms that are made, are presented in the friendliest spirit and for the purpose of stimulating the members to more active discussion.

My position for this discussion is from the standpoint of efficiency, through the least

amount of lost time in changing instruments, having in mind all the while, the maximum comfort of the patient as well as a simplified technic for the operator. The manufacturer and merchant employ efficiency men to watch their organizations for unnecessary efforts, or in common terms, lost motion.

I think one of the most besetting sins of our profession is allowing the salesman for dental manufacturers to load us with instruments, which within a few months are thrown in the discard, or are of no value to begin with in so far as the operator's technic was concerned.

Dr. Pullen has spent years of study in the designing of instruments and those which he develops are of the highest quality.

I think the orthodontist should study his own needs as applied to his particular technic; select such instruments with which he can best fit the bands and adapt with the least amount of lost energy for himself as well as discomfort to his patient, the various orthodontic appliances with which he treats his cases.

Thus, the first plier to come under discussion is that shown in Figs. 3 and 4, incisor band forming plier. This is wonderfully designed for the labial surfaces of incisors and canines but in my hands the S. S. White Plier No. 110 adapts the bands on the lingual surface much better.

The plier in Fig. 5 is well designed for its special purpose but to me is an extra instrument. Instead I use a small cotton roll to protect the incisal edge with S. S. White Plier No. 110 for the applied force.

The plier in Fig. 6 is for slitting incisor or other bands. Instead I have found the small metal scissor similar to S. S. White No. 10, which is always at hand, very adaptable. This plier is not needed very often, and a pair of sharp pointed scissors will do the trick even on molar bands unless extra heavy band material is used.

Plier in Fig. 7 is a very useful one especially for molar bands. The idea of cutting the ligature wire and leaving it on the spool until used is a splendid one if you are accustomed to using short length wire. I prefer longer length except in stainless steel wire. The same comment is applicable to the technic shown by Figs. 8 and 9.

Plier shown in Fig. 12 for contouring molar bands is well designed and useful.

Plier in Fig. 13 I shall pass over as the idea of making a rounded elevation on the lingual surface of molar bands to seat the half-round tubes is a new one to me, and I hardly see the need for such a procedure, I should make the same criticism of the plier shown in Fig. 14.

The plier in Fig. 15 for removing molar bands is very practical, but the same work can be accomplished, and I believe as successfully, with as little discomfort to the patient by using S. S. White No. 110 and a cotton roll to protect the cusps.

The instrument in Fig. 17 is a useful one for those using seamless bands.

I think the plier in Fig. 18 would be one of many which would not alone save the patient a great deal of distress but save the operator from losing his otherwise angelic disposition, which means a lot to the patient as well as the operator.

The plier shown in Figs. 19, 20, and 21 is a well designed plier, and its use might save a great deal of energy in many instances; the same can be said of Fig. 22 for removing a stubborn lingual arch. I have, however, a hook made from broken excavators bent to almost the shape of a fish-hook with which I release the lockwire and remove the arch from the half-round tube without loss of time from changing instruments.

The pliers shown in Fig. 24 are indispensable to any one using the pin and tube appliance. I have had and used them for years. Many of the younger generation of orthodontists hardly know what is meant by pin and tube appliance.

The band adapting instruments shown in Figs. 25, 26, and 27 are not only very useful but well designed.

In place of the instrument shown in Fig. 28 for forcing molar bands to place when using the direct method, I have an oak spatula, not quite so large as a wooden tongue depressor and slightly thicker, made from an old axe or spade handle. These will stand sterilizing and can be turned out by any carpenter at very little expense.

I wish to comment especially on the soldering pliers shown in Figs. 35 and 36. I do not believe these are of Dr. Pullen's designing, so I do not hesitate to say that from my viewpoint, for the use in constructing orthodontic appliances, they are the most absurd, both in

design and material that could be conceived. The material absorbs too much heat and their design is too clumsy for the delicate soldering required in an orthodontic practice.

With your permission, I should like to describe a pair of pliers, which to me, answers all the purposes of the six pairs shown in Figs. 35 and 36.

When you go home to your offices, spend some of the time you do not know what to do with during this "repression," get a pair of common straight pointed steel soldering pliers, cut off the points about 11 mm., grind a slot through the center of each side 6 mm. in length, the slot wide enough to hold snugly a piece of 0.040 arch wire 18 mm. in length over all. Have a jeweler solder with gold solder, bend ends of wire at right angle toward inside of plier, these points 3 mm. in length, file one of the points flat on both sides just so that flat point will slip through the open face of a McCoy tube. With these pliers you can hold round buccal tubes or Angle tubes, McCoy tubes on incisor bands and any pinched band together for soldering. It has many similar uses.

I wish to thank Dr. Pullen for the presentation of this paper for only in this way can these things be brought out, and all can have an opportunity to express their views whether they are right or wrong.

Dr. Herbert A. Pullen.—I am doubly embarrassed in closing the discussion of my paper, first, because of my appreciation of the many complimentary things Dr. Morehouse has said about my work, and second, because of my chagrin over the necessity of answering the well intended, although I believe unwarranted, criticisms of certain instruments which were illustrated in the paper.

If carefully examined, it will be observed that the underlying theme of the paper was the change from makeshift instruments, such as broken excavators, as suggested in one instance by Dr. Morehouse, to instruments scientifically designed to meet the needs of modern orthodontic operative technic.

In almost every instance the scientific design necessitated a change from an old haphazard inaccurate habit technic to a new positive and accurate habit technic.

Dr. Morehouse illustrated perfectly what I was trying to bring out, that most of us are a bundle of habits. If you analyze his discussion, you will realize that on every single point which he made, he referred to his particular habit technic.

For example, he clings to the old habits of using a metal scissor instead of a Case band slitting plier for slitting incisor bands, of using an inaccurately adapted S. S. White plier No. 110 for removing molar bands, of using a hooked instrument made from a broken excavator for removing tight posts of arch locks, and the questionable habit of using a wooden unsterilizable spatula for forcing molar bands to place instead of a metal instrument which can be sterilized.

My contention in regard to our operative technic is that unless we can change our old habit technic to a new one when necessary we cannot progress. Striking examples of this may be found in the habit changes involved in the mastery of the labial arch technic of the new Angle appliances with its accurate alignment of bracket bands, in the accurate technic of arch alignment of McCoy tubes on incisor bands, and in the careful, yet accurate technic of the lingual arch technic of Mershon.

In regard to Dr. Morehouse's comment on the soldering pliers shown in Figs. 35 and 36, I will say that they are of my own design, many of which have been in course of adaptation and change to meet newer soldering requirements for thirty years. They represent an effort to perfect automatic or self-holding soldering pliers, which, on account of their delicacy, take away the least heat instead of the greatest, from the parts to be soldered.

As far as the long ligature is concerned, the old habit technic of using long ligatures, I was trying to suggest a new technic to get away from that. You can save time and lessen the number of motions with the use of short ligatures and a plier of the locking form adapted from the surgical needle holder shown in Fig. 9.

In the design and construction of every instrument which I have described and illustrated, whether my own or another's design or adaptation, the analysis of the instrument from the standpoint of its special requirements was first made, and the general shape and special conformation to meet these requirements followed this analysis.

As I said before, the instruments for orthodontic operative technic thus analyzed, at least in an imaginative sense, design and fashion themselves according to existing requirements.

If we, therefore, follow a consistent analytical method of conformation of these instruments to existing requirements, and force ourselves to change our old, and perhaps antiquated, technical habits for new ones, we shall progress, and our work will be more scientific, more accurate, and much easier and faster than before.

ANTERIOR BAND TECHNIC*

ARTHUR V. GREENSTEIN, D.D.S., NEW YORK, N. Y.

THE restricted hours available for the treatment of patients make it imperative for orthodontists to standardize technical procedures and thus shorten the time necessary for them.

Regardless of whether the labial or the lingual arch technic is employed, the necessity for making one or more anterior bands frequently arises, and the method of using partially completed bands saves many precious minutes at the chair. In this presentation I make no claim for originality in offering the idea of having a prepared stock of anterior bands in graded sizes. However, in advocating the technic outlined below, I feel that some aid may be given to those confronted with the problem of making anterior bands quickly and well.

TECHNIC OF CONSTRUCTION

The bands are made from patterns which are cut from a strip of nickel silver 0.13 in. wide and 0.01 or more in thickness. They range in length from 0.58 in. to

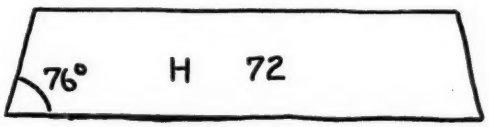


Fig. 1.—Band pattern.

1.06 in. and vary from each other by 0.02 in. Patterns are cut to approximate size, carefully trimmed to an angle of 76 degrees at each end, and finished to the exact size required. Each one is then lettered and marked with its size (Fig. 1).

The finished pattern is laid on a strip of band metal, 0.13 by 0.004 in. and the outline marked on the metal with a knife or sharp instrument. If desired, the band metal can be lettered at this time. The strip is cut, allowing about 1/32 of an inch at one end for overlap. The ends of the metal are then carefully coapted, held with tweezers and soldered, using a high fusing solder. The band is then brought to a red heat and quenched in alcohol, which removes the oxides.

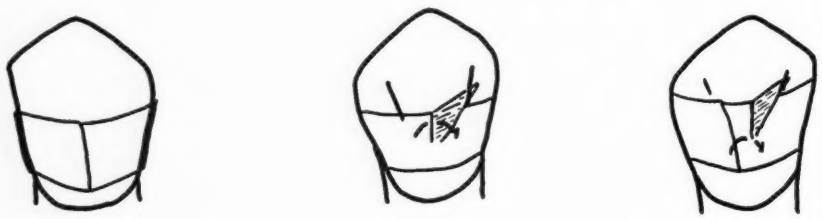
My personal preference is for a band metal which oxidizes when heated. This is due to a small copper content, which permits the metal to be softened by heating to redness and then plunging it into alcohol or water. After the band has been driven and the necessary attachments have been soldered to it, the original temper is easily restored by reheating it and allowing it to cool in the air. Should additional hardness be desired, a suitable tempering furnace may be employed. The original color and brightness of the metal are quickly restored by boiling in acid or alum solution.

*Clinic presented before the American Society of Orthodontists, Toronto, May 20, 1932.

The office stock consists of six bands of each size, kept in a box with suitable compartments; as they are used, the assistant or technician replaces them in spare time. The patterns are kept in the compartments with the bands.

TECHNIC OF FITTING BANDS

From the stock of bands one is selected by the trial and error method, so that it passes slightly beyond the middle third of the tooth. After a little experience the selection of the proper size is accomplished almost automatically. An alcohol lamp and a small jar of alcohol should be placed on the operating table, and as a band is rejected as either too large or too small, it may be sterilized by heating it to redness and quenching in the alcohol. When the band has been selected, it is driven to place by a few light taps with a mallet and band driver. Wherever possible the band should fit well down over the cingulum, thus seating it and increasing its resistance to displacement. The result will be a snug, well fitting band, requiring no additional burnishing or contouring. Occasionally one meets with an atypical incisor which is difficult to fit; in such a case a band should be selected to give a snug cervical fit, and the excess incisal slack pinched with pliers.



A *B* *C*

Fig. 2.—Canine band technic: *A*, labial view showing seam; *B*, lingual view, pinched; *C*, lingual view, seam placed lingually, pinched.

In fitting canine bands it is easier to place the seam labially, and pinch the slack on the lingual side, as in Fig. 2 *A* and *B*. If, however, it is necessary to have a smooth labial surface for the accurate placement of an attachment, such as the McCoy open tube, the band may be reversed as in Fig. 2 *C*, and by shifting the seam slightly to one side of the middle of the tooth, the slack can be taken up where there is but a single thickness of metal.

ADVANTAGES OF THE TECHNIC

Curvature. A study of several hundred teeth has demonstrated that a strip of band metal cut at an angle of 76° and soldered, if properly sized, has sufficient taper to be driven to place on most maxillary and mandibular anterior teeth with a few light taps of a mallet. The shape of the band after soldering can best be understood from the illustration, Fig. 3. It can be readily seen that the cervical and occlusal periphery show a definite dip toward the gingival. This feature permits us to utilize the cingulum as an aid in retention when the seam is placed lingually. This advantage is made more apparent by examining the comparison in Fig. 4. The dotted line represents the position taken by a band not made by this technic, such as a seamless ready-made band. In order to obtain proper cervical fit, a larger band is necessary, requiring excessive trimming to avoid causing

interproximal trauma. With the soldered band, on the other hand, the curvature of the cervical border enables it to clear the peridental tissues without being festooned.

Width. Even a cursory examination of several natural teeth will reveal the fact that in the ovoid and tapering type of incisor the cervical circumference varies considerably from that at the contact point. The wider the band metal used, the greater is the discrepancy between the two circumferences it must encompass. The selection of band metal 0.13 in. wide was made after considerable experience had shown that wider bands would require pinching to obtain closely adapted incisal margins. Fig. 5 shows this advantage of the narrower metal.

Fig. 3.—Side view of a soldered band showing gingival dip.

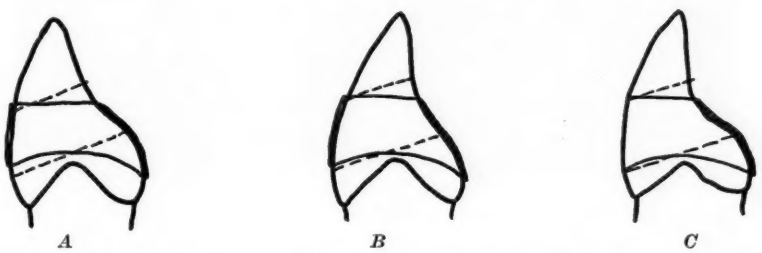


Fig. 4.—Utilizing the cingulum for retention. Dotted lines show position of seamless bands. *A*, maxillary central; *B*, maxillary lateral; *C*, mandibular central incisor.

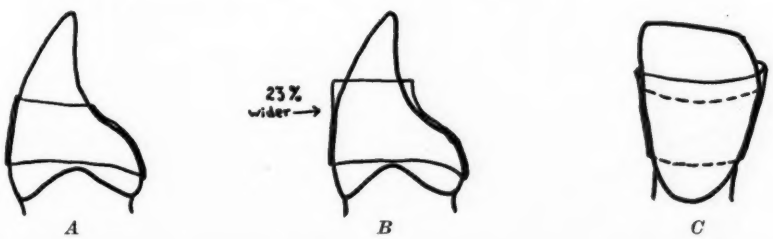


Fig. 5.—Advantages of narrow bands: *A*, narrow band in position; *B*, wider band in position; *C*, dotted line shows position of narrow band, solid line indicates excess incisal slack of wider band.

Experiments with bands narrower than 0.13 in. showed that such bands do not possess sufficient rigidity to resist distortion under the combined stresses of mastication and tooth movement, and their use would necessitate frequent cementation and repair.

Economy. The amount of operating time that is saved by employing this technic is important enough to warrant its consideration. But in addition to offering a saving of time, this method also has the merit of being economical. There is very little waste in preparing the bands, and their reduced width makes them correspondingly lighter. However, the principal advantage of the technic is in the comfort and convenience it affords the patient and the operator.

A NEW LOCK FOR ANCHOR TEETH*

CHARLES A. SPAHN, D.D.S., NEW YORK, N. Y.

A CONSIDERABLE number of years has passed since teeth were generally regulated with the use of labial alignment wire or Angle's E arch and bronze ligature wire tied around the necks of the teeth which were to be moved. This method produced some very good results. However, it met the requirements of but

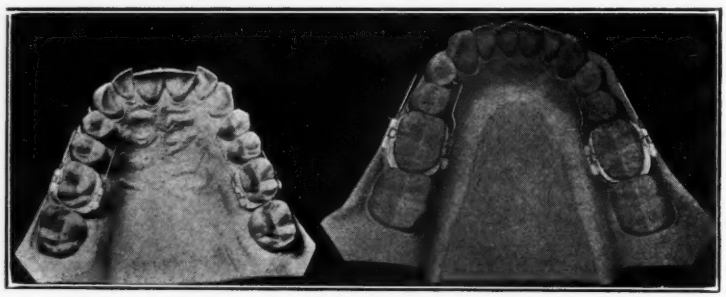


Fig. 1.

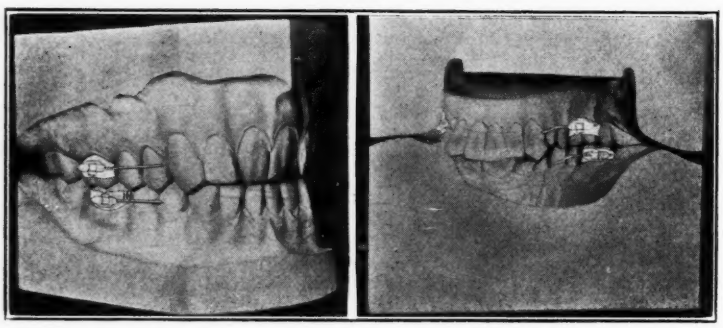


Fig. 2.

a very few cases and demanded constant attention in order to keep the appliances efficient and the soft tissues in a healthy condition. Many changes since that time have been developed, such as the reduction of the size of the wires that are used and the refinement of the attachments to the anchor teeth.

After record models and a diagnosis have been made for the case under consideration for treatment, every operator of matured experience realizes the possibilities in the variation of the design of appliances that may be used; for instance, bands on the anterior teeth with many different kinds of attachments to them, both labial and lingual. This feature also includes the anchor teeth, and this clinic il-

*Clinic presented at the thirty-first annual meeting of the American Society of Orthodontists, Toronto, Canada, May, 1932.

lustrates a new lock which can be used to marvelous advantage on both the lingual and the facial sides of the anchor teeth.

This lock presents many advantages over all other forms of attachments to the anchor teeth because of the facility in changing the length of all arches at will. (Figs. 1 and 2.) During the past two years, this feature has saved my remaking many appliances when the patient has outgrown them. This new lock permits the expansion of the molar or anchor teeth in a very kindly manner without a torso movement, as is the case with half-round lingual tubes. It also permits the arch to lie in a straight line at the gingival margins, which obviates the necessity for vertical bends in the arch wire. The lock is always located out of the influence of the occlusion in all positions. You may note, also, that it can be used with all forms of attachments on the anterior teeth, and it also has advantages when used with half-round tubes on one side of the arch and this new lock on the opposite side.

THE EVIDENCES OF GROWTH AND DEVELOPMENT AT ADOLESCENCE*

FRANK A. DELABARRE, BOSTON, MASS.

THE period of adolescence is marked by the acceleration of growth in two directions, forward for the accommodation of the second permanent molars and vertical to permit the formation of the curve of Spee. The development is marked by the transition from the child's mixed dentition to that of the adult, involving the loss of the remaining deciduous teeth and the addition of sixteen permanent ones.

There is no increase in arch width in the premolar region at this time.

The development of the curve of Spee is a most important change, and the first step is the rapid and pronounced elongation of the deciduous molars just prior to exfoliation. It is sufficient in amount to open the bite to the extent that the first permanent molars are not in contact for the time being, permitting their elongation to keep pace with the vertical growth of the face.

The added anteroposterior diameters of the deciduous molars, as compared with that of the succeeding premolars, is 1.5 mm. greater in the maxilla and 3.6 mm. in the mandible. Those spaces are gradually closed by the forward migration of the first permanent molars, as the deciduous molars are lost in succession. As they move forward from the almost vertical position they occupied in the mixed dentition, they tip forward and incline buccally in the maxilla and lingually in the mandible.

The mandibular molars move 2.1 mm. more than those in the maxilla, and this together with their elongation and tipping permits them to come, for the first time, into their adult occlusal relations. Prior to this time all the permanent teeth have been, in position and function, merely additions to the deciduous set.

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*Clinic presented at the thirty-first annual meeting of the American Society of Orthodontists, Toronto, Canada, May, 1932.

The maxillary premolars erupt before those in the mandible, which allows them to assume a fixed position in what is to be the low point in the curve of Spee.

The practical clinical points to be derived from this study are:

(a) The added argument for conservation of the deciduous teeth so that growth and development may proceed according to the natural plan.

(b) The full anteroposterior diameters and form of the occlusal surfaces should be preserved or restored.

(c) Premature loss of the deciduous molars should be met by the application of space maintainers which should also provide a measure of occlusal function to prevent elongation of the opposing teeth.

(d) The deciduous molars should be retained to the last moment of tolerance of the patient so that they may perform the most important function of elongation.

(e) Each and every tooth has a form, position and function essential to the developmental changes from the deciduous, through the mixed, to the adult dentition, each of which has its distinctive characteristics of normality.

(f) The succession of eruption is far more important than the chronologic age at which it occurs.

(g) The curve of Spee cannot acquire a normal form without adherence to these fundamental requisites.

PLIERS FOR REMOVING PIN OR POST PORTION OF LINGUAL LOCKS*

E. N. Bach, D.D.S., Toledo, Ohio

THE pliers described here were designed to remove the pin portion or post of the various lingual locks used in connection with lingual arches. The instrument is patterned after the Lowrie wire stretcher plier. It is designed so that it may be used for removing either right or left, maxillary or mandibular pins from lingual locks on molar bands. Fig. 1 shows end view, the exact size. Both upper and lower beaks are divided into right and left working parts. The end of the lower beaks *A* is round and approximately 0.034 in., and small enough to pass easily into the female part of locks using round or half-round tubes, Johnson locks, Aderer locks, etc.

In removing lingual arches from the lock, the beak *A* is placed against the free end of the pin portion or post; and point *B*, the flat surface of the upper beak rests against the occlusal end of the tube. When the handles are compressed, *A* is forced into the tube (Fig. 3), forcing the post out. Fig. 3 illustrates the use of the pliers on mandibular lingual locks. The illustration shows the Ellis one piece arch and tube with plier in position to remove the pin or post section.

The pliers are applicable in nearly all cases in the mouth depending upon the location of the free end of the lock. They are quite freely used in the laboratory

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after heat has been applied to appliances during the course of construction. This is especially true in connection with half-round pin and tube locks.

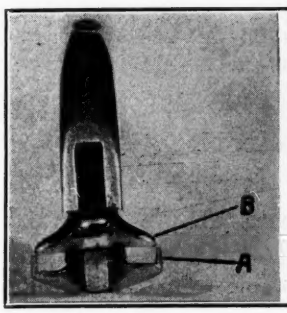


Fig. 1.

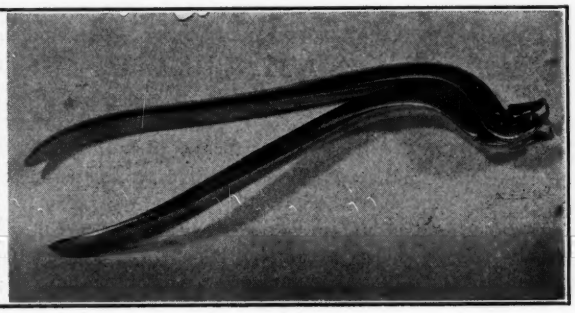


Fig. 2.

Fig. 1.—End view of plier, exact size.
Fig. 2.—Side view of plier, note especially the beaks and the hinge. The position of the hinge allows the beaks to work to best advantage.

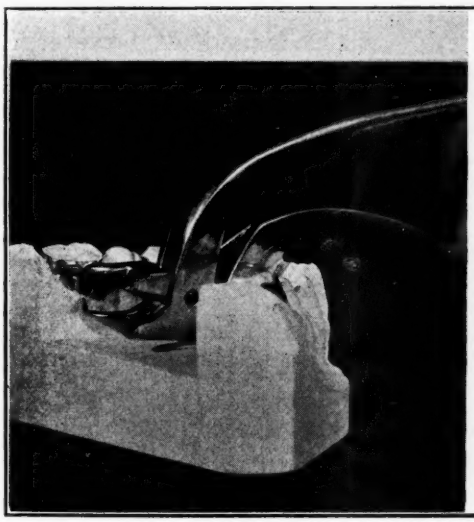


Fig. 3.

Fig. 4.

Fig. 3.—Showing the position of the plier when removing the pin portion of a lock on the left mandibular molar band. The plier is shifted across the mouth to remove the opposite end of the arch. In both cases the tongue is protected from the free ends of the plier by a mouth mirror.
Fig. 4.—An enlarged view of the plier showing its use on the maxillary arch. The lock is a half-round pin and tube, and the illustration shows the pin part of the way out and the plier in the position which has caused the separation of the pin and tube.

METHOD OF UNCOVERING IMPACTED CANINES AND ATTACHMENTS USED*

HAROLD E. SIPPEL, D.D.S., BUFFALO, N. Y.

ONE of the various complications in orthodontic cases of which there is very little said in textbooks is the treatment of impacted teeth. The maxillary canine no doubt is the greatest offender; although it is not uncommon to have central and lateral incisors and occasionally premolars and molars which require surgical aid in erupting.

From the standpoint of esthetics, the maxillary canine is highly important in that it has the largest root of any tooth and is outstanding in determining the contour of the mouth. Therefore, this clinic will be limited to the method of uncovering and the attachments used on these teeth. The same methods, however, can be used on any of the anterior teeth.

SURGICAL ERUPTION OF TEETH

Unerupted teeth well past their normal eruption time are impacted because of their position and impingement. This impingement may be complicated in several ways: It may be osseous and soft tissue. It may be one or two other teeth, or it may be a combination of the above, namely, osseous and soft tissue and one or two other teeth.

The operation to facilitate the eruption of the impacted teeth is performed in the following manner.

The first requirement is a complete set of x-ray pictures. The radiograms must be very accurate. They must include several different angles and occlusal views. The importance of knowing exactly where the impaction lies before the operation is started cannot be overemphasized. Accuracy of location simplifies the operation and minimizes postoperative pain.

The first step in the operation is to remove the soft tissue. This is accomplished in the following way: With a sharp lancet make a circular incision down to the bone, and a circle including an area somewhat larger than the crown should be removed in mass. The next step is to remove the osseous tissue. This can usually be accomplished with sharp chisels and hand pressure. Occasionally it may require the use of the mallet. Where possible the crown should be exposed to a point just approaching the dentoenamel junction.

One essential point in this procedure is that the opening should be as an inverted cone. This insures coverage of the bony margins with sufficient amount of soft tissue.

Then with electrocautery the soft tissue cut surfaces are quickly and lightly cauterized. This checks hemorrhage, tends to avoid infection and discourages a

*Clinic presented at the Thirty-First Annual Meeting of the American Society of Orthodontists, Toronto, Canada, May, 1932.

quick filling in of tissue. The patient is then instructed to use at frequent intervals a sodium perborate mouth wash and to return in about a week.

At that time the cautery is again used but held on a little longer in order to remove any new granulation tissue and to discourage granulation still further. However, should the tissue form rapidly and the tooth move slowly, the cautery treatment should be repeated.

In the event that the crown of an impacted tooth is wedged against the root of an adjoining tooth, and in the process of surgically uncovering this impaction it becomes necessary to expose the root of the adjoining tooth, remove only the coronal bone making a flap of the soft tissue which is then sutured. This condition rarely occurs; but if procedure is the same as in an ordinary case, the impinging, adjoining tooth will probably be lost.

In about thirty days the tooth will have sufficiently erupted so that a casting can be made. This casting may be just a tip over the very end of the tooth, an overlay covering the lingual and mesial or distal surfaces, or a complete band.

Fig. 1.

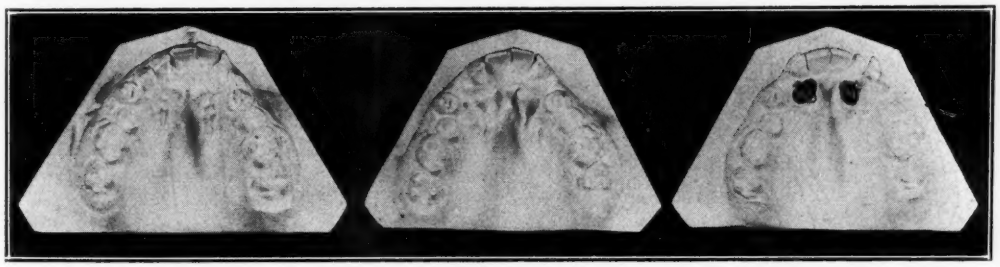


Fig. 2. Fig. 3. Fig. 4.

In constructing these tips, overlays or bands a sharp impression of the tooth is necessary. The best results are obtained by using a thirty-six gauge copper band contoured as nearly as possible to the exposed portion of the crown. The copper band is then completely filled with impression compound and forced to place by bearing steadily and firmly with the thumb. After chilling and removing, the impression is filled with investment material; and a thin, neat, accurate casting is made. This will be found far superior to any type pin or spur cemented into a drilled hole of an otherwise perfectly sound tooth. Fig. 1 shows a few cast tips which have been used on cases which are finished.

Fig. 2 shows a case of two impacted maxillary canines with the deciduous canines still in place. The patient, a girl sixteen years of age, had previously been treated by a general practitioner who failed to note the deciduous teeth present. The cast shown in Fig. 3 was made thirty days later, and Fig. 4 shows canines with cast bands in place three months from date of uncovering. Due to the great amount of space needed, these teeth received no immediate mechanical interference.

The next case is that of a boy sixteen years old at the time the canines were uncovered; the deciduous canines had been extracted a year and a half previous. Fig. 5 shows permanent teeth thirty days after surgical interference, ready for band attachments; and Fig. 6 shows bands on and working.

Figs. 7 and 8 show different type attachments which can be used on these small bands; the Jackson attachment to receive long finger spring, and the McCoy open tube, respectively.

The third case is that of a boy seventeen years of age. He had been suffering from constant headaches and earaches for more than two years. All during this period he was receiving expert medical attention. This boy's dentist upon carefully examining the mouth immediately became suspicious of the canines present and proceeded to x -ray that region. Fig. 9 reveals the permanent canines just

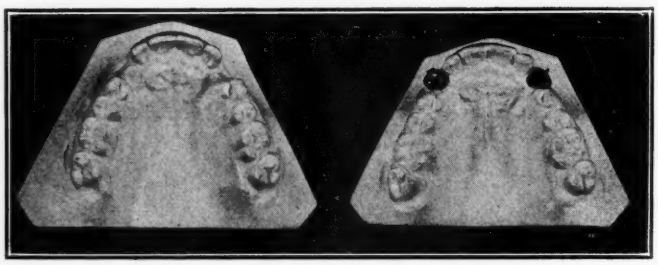


Fig. 5. Fig. 6.

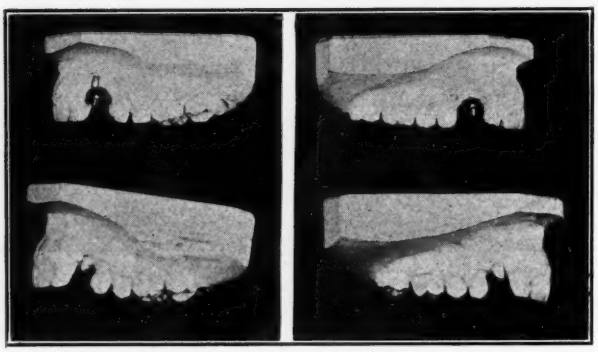


Fig. 7. Fig. 8.

palatally to the distal of the central incisors. Fig. 10 is an occlusal view of this case and Fig. 11 shows impactions immediately after the deciduous canines, soft tissue and coronal bone were removed. Note the amount of tooth surface exposed and compare with Fig. 12 some thirty days later, showing permanent teeth erupting in the palate. One month from date of uncovering these impactions the whole pathologic condition had disappeared. There has been no recurrence for the past year and a half while this patient has been under treatment. An interesting story connected with this case is that the patient had been striving for two years to make the high school football team. The day of a game he would have to stay home due to the same head pain. Last year he received his football letter and was not out of the game more than five minutes for the whole season. This instance illustrates the importance of relieving pressure caused by impactions. No doubt if this case

had not been treated, the patient would have experienced more complications as time went on. Fig. 13 shows case twelve months later with appliance used.

Every orthodontist at some time or other will have a case of adjoining impactions where the crowns of two teeth are crossed and become locked on each other. These cases can be beautifully handled by following the procedure described in this

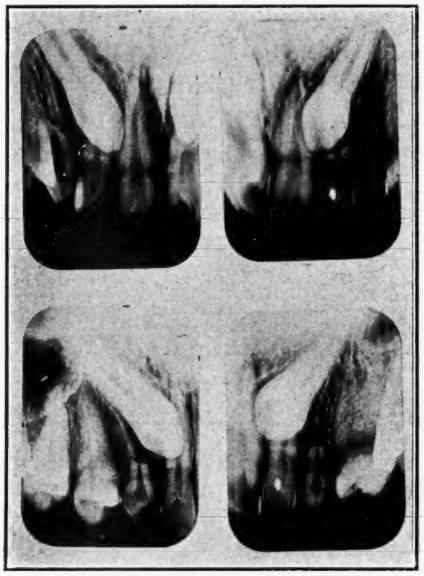
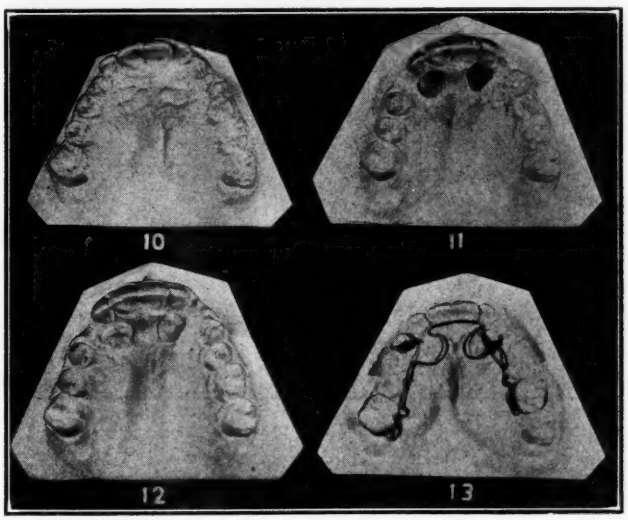


Fig. 9.



Figs. 10, 11, 12, and 13.

clinic. For example, the crowns of a central and lateral incisor are impacted and crossed in such a manner that the two mesial corners are about even. When the crowns of these teeth are uncovered, they will begin to erupt and have a strong tendency to drift toward their respective positions.

In conclusion it is necessary to enumerate only a few of the advantages de-

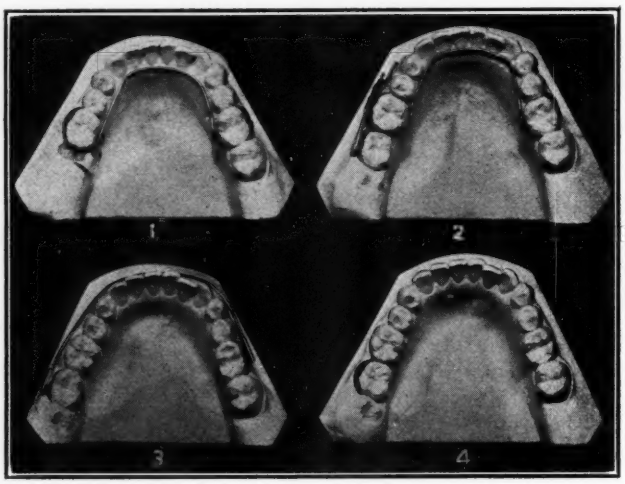
rived in handling impactions in this manner: First, there is less postoperative pain. These cases do not have to be packed with gutta-percha or compound to prevent granulation. Second, it is not necessary to drill into a sound tooth for pin or spur attachment. Third, the attachments used are more secure and easier to manipulate. The tips, overlays or bands used regardless of size, rarely have to be recemented. Fourth, the tooth erupts more rapidly due to the amount of tooth surface exposed. Fifth, any complications caused by pressure of the impacted teeth are almost immediately relieved.

The ease and simplicity of treating impactions as described in this clinic cannot be overemphasized. I have treated many cases, and in not one instance has it been necessary to operate a second time.

APPLIANCES FOR TREATING IMPACTED MANDIBULAR MOLARS*

ALLEN EVERETT SCOTT, D.D.S., SAN FRANCISCO, CALIF.

THE appliances which I wish to show are particularly adapted to the treatment of mandibular second molars; although with some modification they probably could be used in the treatment of other impacted molars. Impacted second molars are not rare, and to make them useful teeth is usually highly desirable.



Figs. 1, 2, 3, and 4.

Fig. 1 shows a condition in which a second molar is so badly impacted that it is not possible to place a band on it. To the end of a lingual arch is soldered a long loop of spring wire. This loop is so adjusted that it exerts a backward pressure on the molar. In some instances it is necessary to drill a small hole in the impacted tooth for engagement of the end of the loop. To make the loop hold, a small ball is fused on the end. When it becomes possible, a band is placed on the impacted molar.

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*Clinic presented at the thirty-first annual meeting of the American Society of Orthodontists, Toronto, Canada, May, 1932.

Fig. 2 shows an appliance for tipping a molar when it is possible to place a band on the tooth. The idea for this appliance was received from Dr. Lloyd Lourie of Chicago. This appliance consists of a band on the first molar with a horizontal tube through which slides a wire to a swivel joint on the second molar. As shown in the illustration a small elastic band or silk ligature is placed between the hook on the first molar band and the hook on the wire. The pressure so exerted causes the molar to move in a posterior direction.

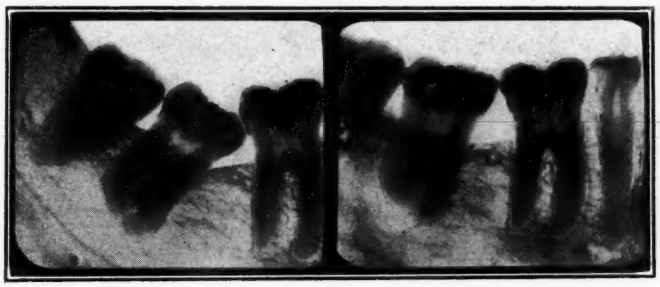


Fig. 5. Fig. 6.

Fig. 3 shows another way to accomplish the same thing. A labial wire is run from the second molar to the first molar on the opposite side. A spur is run to the opposite second molar for the purpose of increasing the anchorage. The labial wire is adjusted at, or a little below the gingival of the anterior teeth. It is then raised and ligated to these six teeth with stainless seel wire. This will tip the second molar.

Fig. 4 shows a method of retention when the second molar is in place.

Figs. 5 and 6 show conditions before and after treatment by these methods. It will be observed that the third molar was moved along with the second and is now a useful tooth.

THREE METHODS OF CORRECTION FOR OPEN-BITE CASES*

H. C. METZ, B.S., D.D.S., F.A.C.D., PITTSBURGH, PA.

IN PRESENTING a clinic on open-bite cases, three cases were selected to demonstrate three different methods of procedure.

CASE 1.—Patient was a girl eight years old. I expanded the maxillary and mandibular arches with lingual appliances. The mandibular teeth were moved forward with intermaxillary rubbers. The downward development of the maxillary

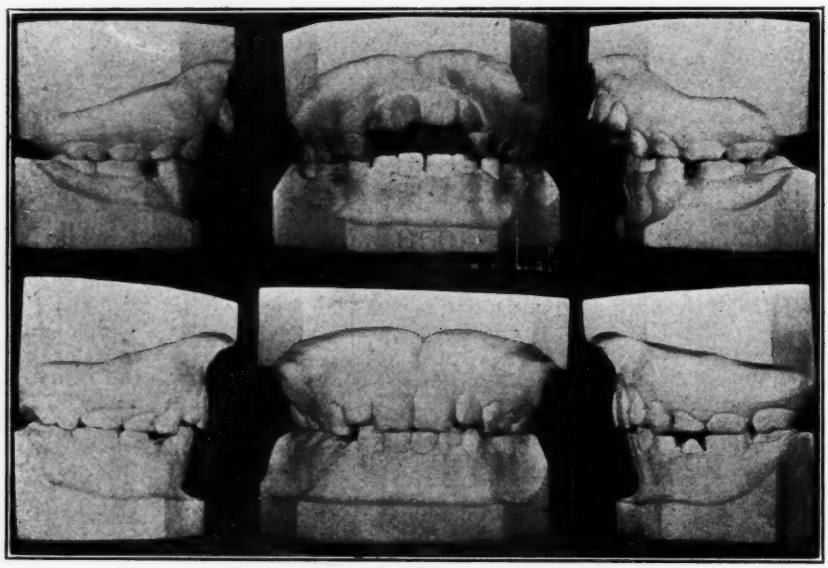


Fig. 1.

anterior teeth continued without any mechanical aid as the expansion of the arches progressed. (Figs. 1 and 2.)

CASE 2.—Patient was a young man, aged eighteen years. X-ray pictures showed the presence of impacted maxillary right and left second premolars and maxillary right and left third molars.

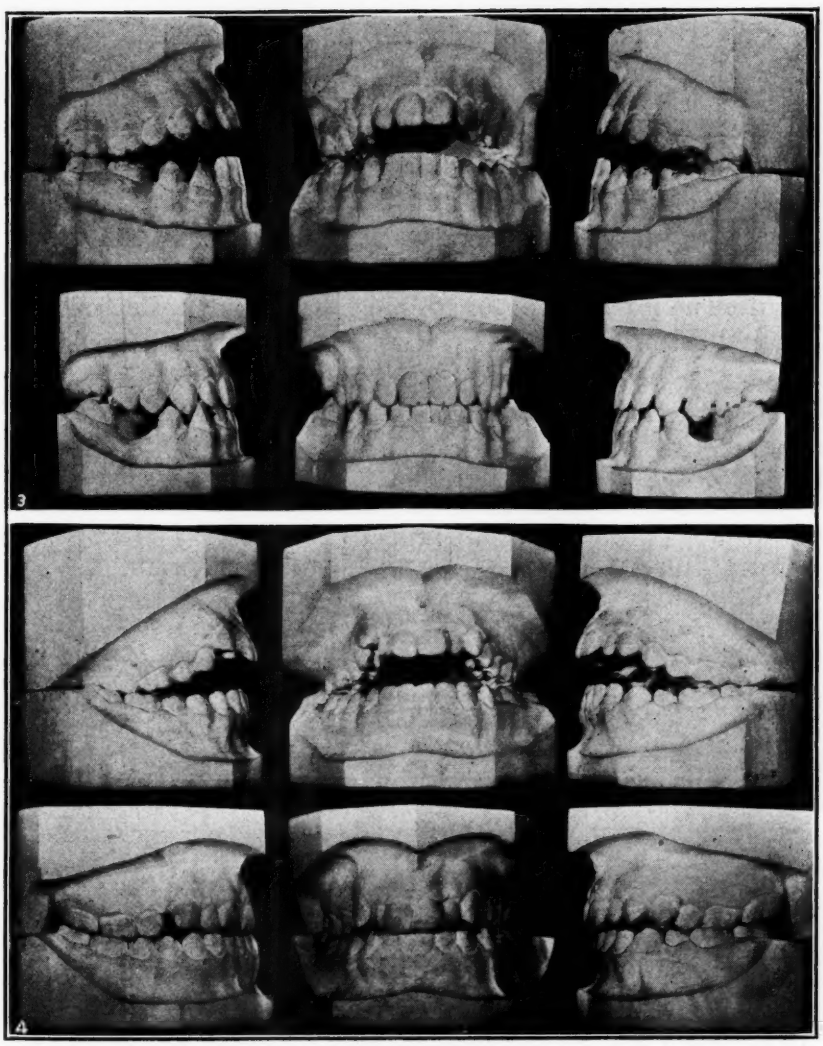
The maxillary right and left first molars were abscessed, and both maxillary second molars had large distoclusal cavities. The mandibular right and left first molars were abscessed.

The models of this case were mounted, with correct bite, on an articulator, and the posterior teeth were then cut off the model. The bite closed as the teeth were eliminated. It was decided to extract the maxillary right and left, first and second molars and the mandibular first molars. The bite then closed as shown by models taken of patient one year later. (Fig. 3.)

*Clinic presented at the thirty-first annual meeting of the American Society of Orthodontists, Toronto, Canada, May, 1932.

CASE 3.—Patient was a young woman, aged twenty-two years. This case was examined shortly after completion of Case 2.

Fig. 2.



Figs. 3 and 4.

Models were mounted on an articulator, and the occlusal surfaces of the molars were cut away. The bite closed to edge-to-edge position.

The maxillary right first premolar was extracted and a lingual appliance adjusted to widen the maxillary arch and to move the maxillary right canine distally.

With the use of articulating paper and mounted stones, the cusps were removed in the following manner: first, the maxillary teeth were ground, and in two weeks the mandibular teeth were ground. Alternate grinding continued every two weeks for a period of nine months, and the result shown by the models was obtained. At no time did the patient complain of any discomfort. (Fig. 4.)

STAINLESS STEEL*

GEORGE M. ANDERSON, D.D.S., BALTIMORE, MD.

BY THE use of a special flux which the orthodontist can prepare from purchases made at the drug store, it is possible to solder stainless steel with the regular 14 K. orthodontic wire solder. Steel, whether it be wire or tubing, may be attached to steel or to platinous gold alloys. The flame should be soft, not too hot, and plenty of flux should be used. Care must be exercised not to burn the wire. There should be no lost motion, for too much heating or too often will result in poor union and remove temper from wire. If acid pickle is used for cleaning, it should be for the briefest period; too long immersion will injure wire. Pumice either by buffer wheel or between fingers is safer.

Formula for flux:

Potassium fluoride } equal parts
Boracic acid powder }
Hydrochloric acid, to make paste.

*Clinic presented before the American Society of Orthodontists, Toronto, Canada, May, 1932.

REPORT CARD FOR ORTHODONTIC PATIENT*

PAUL G. SPENCER, D.D.S., WACO, TEXAS

GAINING the confidence of parents and patient, securing the desired cooperation of all parties concerned are vitally necessary to successful treatment. Certainly a very definite responsibility rests with the parents and patients. Experience teaches that a certain percentage of patients do not follow instructions or cooperate; and in a majority of these cases when treatment falls short of the desired improvement, the orthodontist is held to be the sole cause of fault.

The average noncooperating patient resents being called to account at each visit, and every orthodontist objects to alibi his efforts during treatment or to be continually pleading for cooperation verbally or by correspondence.

Report cards have been found in our public and private school systems to be the ideal method of record. When the parents are advised before treatment starts that regular reports will be made on the case, we automatically prepare them to expect comments either good or bad on the progress of the case, and on the degree of cooperation with the work.

Any report that entails a great amount of work, typing, or personal supervision will be neglected. The copy of the report card shown in Fig. 1 is to be sent at regular intervals, at least four times a year; it is either mailed separately or enclosed with statements, and serves a worthwhile purpose.

The information sent is fully known by the secretary and can be made out without any question or worry on your part. The duplicate is filed for future reference if necessary, and it is the exceptional parent who will fail to see your position when confronted with the positive evidence that the parent and patient have not cooperated or followed instructions, and also realize you have been regularly calling their attention to their neglect.

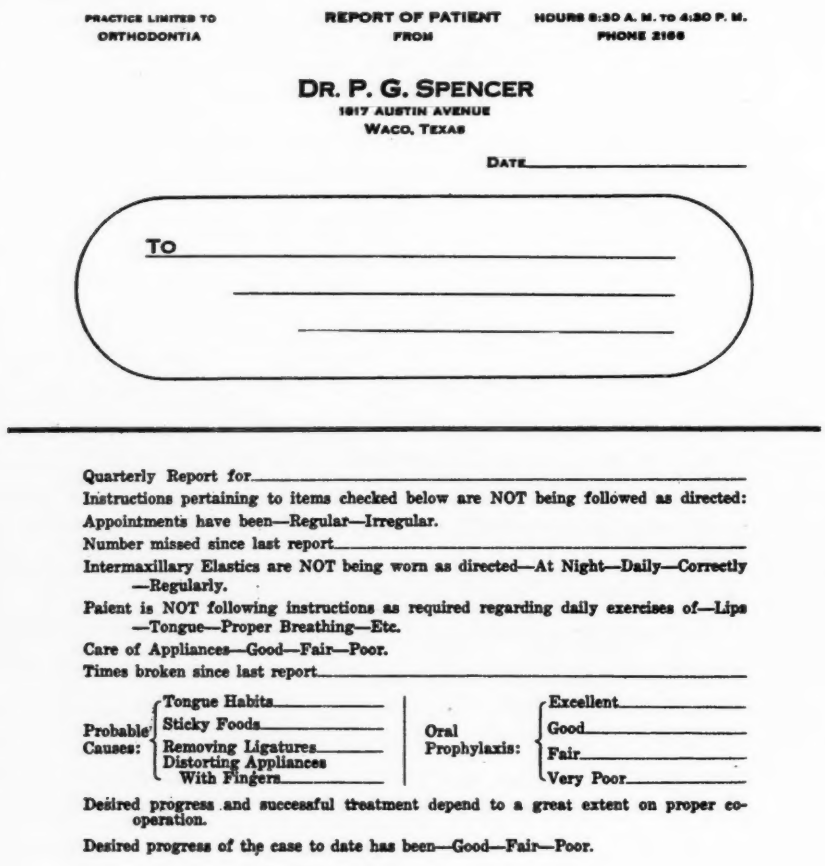
You have a definite record of the added expense to you through breakage, a written record of lack of proper care of teeth and appliances; and should decay occur, a more positive cause than appliances can be shown.

The most agreeable surprise will be the appreciation shown by the parents to whom good reports are sent. It is a safe practice seldom if ever to give "excellent" in the care of the mouth in any case, even where proper care is given. It is best to keep the patient striving to attain the best mark. Certain changes in the card may be necessary in many practices. Numerous changes have been made since the first card was used. I wish to give credit to Dr. H. A. Cooper of Lancaster, Pa., who first suggested the idea and whose card was first used.

I should appreciate very much receiving suggestions for additional ideas that have been found helpful by those who utilize this plan.

*Clinic presented at the thirty-first annual meeting of the American Society of Orthodontists, Toronto, Canada, May, 1932.

Except for filling in the address (which is not necessary when sent with regular statements), no typing is necessary. All notations are made by marking out the words not desired or checking the items you desire to call to the attention of the parent, and by using carbon paper the duplicate is easily obtained. Pads may



PRACTICE LIMITED TO ORTHODONTIA

REPORT OF PATIENT FROM

HOURS 8:30 A. M. TO 4:30 P. M. PHONE 2166

DR. P. G. SPENCER
1617 AUSTIN AVENUE
WACO, TEXAS

DATE_____

TO_____

_____

_____

Quarterly Report for_____

Instructions pertaining to items checked below are NOT being followed as directed:

Appointments have been—Regular—Irregular.

Number missed since last report_____

Intermaxillary Elastics are NOT being worn as directed—At Night—Daily—Correctly—Regularly.

Paient is NOT following instructions as required regarding daily exercises of—Lips—Tongue—Proper Breathing—Etc.

Care of Appliances—Good—Fair—Poor.

Times broken since last report_____

Probable Causes: Tongue Habits_____ Sticky Foods_____ Removing Ligatures_____ Distorting Appliances With Fingers_____

Oral Prophylaxis: Excellent_____ Good_____ Fair_____ Very Poor_____

Desired progress and successful treatment depend to a great extent on proper co-operation.

Desired progress of the case to date has been—Good—Fair—Poor.

Fig. 1.

be printed to match selected stationery, or the original and duplicate may be in color to fit in with any record scheme. The cards in use at present are to be folded and fit the regular size open-window envelopes, making an additional saving of work and time.

ELECTRIC PLASTER MODEL TRIMMER*

ADELBERT FERNALD, B.S., M.A., D.M.D., BOSTON, MASS.

THE electric plaster model trimmer which I designed and have been using for several months, I consider a great improvement over any other trimmer I know of. Since exhibiting* this machine, it has been greatly improved by having all four knives set at an entirely different angle so that it will partially cut the cast from the bottom upward, leaving a smooth even surface at right angles to the base. Another great improvement is having the cutter attached directly to a one-quarter horse-power motor.

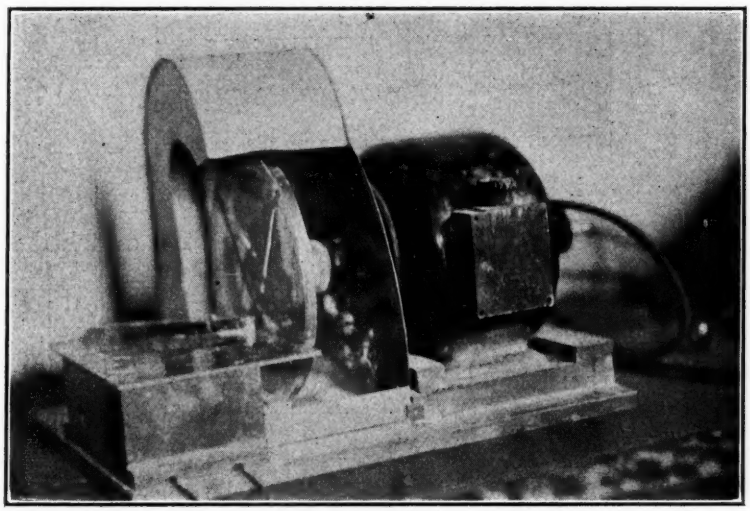


Fig. 1.

The machine will trim the cast very quickly, taking away seven thousand or more shavings per minute. It has an eight and one-quarter inch disk with four milling knives attached directly to the shaft of the motor.

When the front part of the plaster housing pan is in place, the plaster dust cannot fly out. In Fig. 1 it has been removed to show the construction of the machine.

A removable table with the surface at right angles to the cutting disk has a meter gauge which will give accurately all the angles necessary in trimming a cast.

The machine works best on a cast that has been poured a few hours. If using it on a dry cast, the cast should be soaked in water only a few minutes before cutting.

An eight inch sanding disk can be attached to the motor in place of the cutting disk with the knives if one wishes to trim perfectly dry plaster casts.

*Clinic presented at the Thirty-First Annual Meeting of the American Society of Orthodontists, Toronto, Canada, May, 1932.

The outfit has received so many favorable comments that I feel greatly repaid for all the time I have spent in developing it, and I hope it will lead to something even more efficient.

In this newer model (Fig. 2) the knives in the milling disk are nearly housed in by aluminum castings. All plaster dust and chips are forced down below into a plaster drawer, which should be emptied frequently. By removing the lower part of the cabinet and having the trimming machine rest on top of a workbench

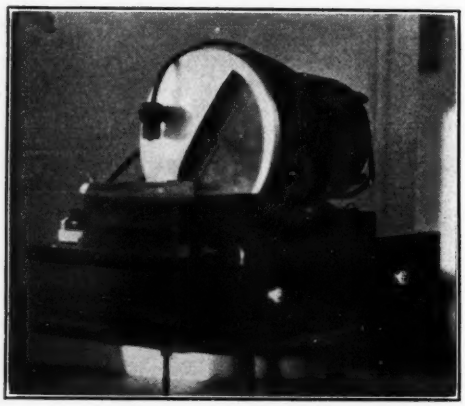


Fig. 2.

with a hole cut through connecting with a large box or bag attached underneath, all surplus plaster is properly taken care of.

In my hands this machine has given perfect satisfaction, and I am sure it will if it is properly used. All knives must be kept sharp by honing and must not be used on plaster that is too wet without the knives being dried, as otherwise they will rust. If knives are set so that they project too much, the machine will cut the plaster away faster than the eye can follow.

I do not claim that this machine is perfect, but I do find it very useful, a great time saver, and it will do the work if it is properly used and cared for.

DEPARTMENT OF
DENTISTRY FOR CHILDREN

DENTAL PRACTICE FOR CHILDREN

SAMUEL D. HARRIS, D.D.S., DETROIT, MICH.

IN TWO recent investigations with which I am familiar, one local and the other national, dentistry for children was acclaimed the subject most in demand by the dental profession. This is a decided reversal of trend from that observed ten, or even five years ago, when a paper or clinic on the subject attracted barely a handful of eager participants.

Today, with new books recently published, with new sections of magazines created, and with special groups organized to serve the rapidly expanding demand for information, the demand continues to exceed the supply of available material. Requests for additional facts on the subject are constantly being received, especially by those who have hitherto cultivated the field through individual and frequently isolated effort.

With the intention of being helpful to those seeking this information and to stimulate a wider recording of other's experiences, in order to evaluate more properly our effort of which much is broadly empirical, this outline on the practice of dentistry for children is prepared, and for convenience it is divided into seven sections: (1) the strategy of handling children; (2) economic considerations; (3) prophylaxis and home care; (4) cavity preparation and filling materials; (5) capping and treatment of partially and totally nonvital deciduous teeth; (6) instruments for exodontia and the choice of an anesthetic; and, (7) bridges, prosthetics and preorthodontia for children.

THE STRATEGY OF HANDLING CHILDREN

The statement has been made authoritively that "ability to handle children successfully is an inborn quality." Personally, I prefer to subscribe to the thought that many, men in particular, possess this ability through careful cultivation.

It is unfortunate then that there are dentists well versed in the technical requisites of dentistry for children, desiring children in their practice, who have become discouraged with this work solely because of failure in this department. The following suggestions and method of receiving the child may be helpful.

Suggestions.—First, see children only by appointment, reserving fifteen to thirty minutes for each. Second, segregate all juvenile patients, booking their appointments for a specified time announced as especially reserved for children each week. I would recommend four thirty to five thirty o'clock on school days and nine to twelve o'clock on Saturdays for school children, and ten to twelve o'clock o'clock or two to three o'clock for children of preschool age.

This concentration of the appointments of his child patients has many advantages for the dentist in general practice. It is specialization in part and has the advantages familiar to specialization. For example, it permits adequate time to administer a calm unhurried service for each child patient. It eliminates the exhausting switching back and forth from adults to children, with dissipation of time and energy. It furnishes a background of happy examples for the newcomers to pattern after. And, it emphasizes a special interest in children, thereby attracting special notice and publicity for the dentist.

Method of Receiving the Child.—When the child arrives he enters a comfortable reception room probably not unlike his own home. His strangeness is soon dispelled by an interesting toy or book provided by a friendly assistant who looks to his immediate comfort, and the child is permitted to spend a few moments in relaxing play. Incidentally he is also permitted to observe through the opened treatment room door another child patient who is accepting the dentist's service without event. Convinced thus that there is nothing to fear, the newcomer, accompanied by his mother, willingly enters the treatment room. By this time he anticipates a pleasant visit.

The child is given a moment or two to become familiar with the treatment room and with the dental chair into which he is seated, and the dentist enters, greeting first the parent and then the child by name (James, not Sonny). After ascertaining the wish of the parent, the child's dentistry is begun.

It is vital to the success of child management to note that the child's dentistry is invariably begun with a pleasant operation, usually a prophylaxis. First impressions are lasting—and even when an extraction or other urgent work is requested, a moment or two spent in brushing the child's anterior teeth with a soft B. S. polisher is never considered wasted.

Showing the child how pleasant dentistry can be, pays large dividends in future cooperation and confidence. It breeds a wholesome confidence which gives a dentist in general practice the biggest element of boosters that is available to him. And who is there unappreciative of boosters, particularly during this period of economic uncertainty?

ECONOMIC CONSIDERATIONS

It seems that parents have continued to care for their children's teeth even though the stress of the times has precluded the possibility of their caring for their own. Thus improvement has carried dentistry for children from a nonproductive to a productive item in dentistry, and this today is widely reported by those who have encouraged their juvenile practice.

In speaking to one of those dentists a few weeks ago who has managed to keep busy on the children's part of his practice, working from four thirty to five thirty o'clock on school days and nine to twelve o'clock on Saturdays, I was impressed to find that he had been able to do more than pay his annual office rent with the net proceeds. This work was consuming only eight hours a week, and the dentist was frank to admit that it was the only thing which permitted him to remain in practice and pay his bills during these times.

If there are those reading this article who have excluded children from their practice, it is conceivable on this basis that they have shut out a considerable por-

tion of their net income. And they have done infinitely more. They have excluded the leaven of dental practice and a most generative source of publicity. For the child brings his parents and his friends, and his friends bring their parents and friends, as children are not remiss in proclaiming a dentist's ability—loudly. They tell the universe in no uncertain terms that you are the best dentist in the world.

In retrospect I would say that dental practice for children is remunerative; and, what is more significant economically, it has, if properly managed, the unique quality of adding to itself like a ball of snow rolling down a snow covered hillside.

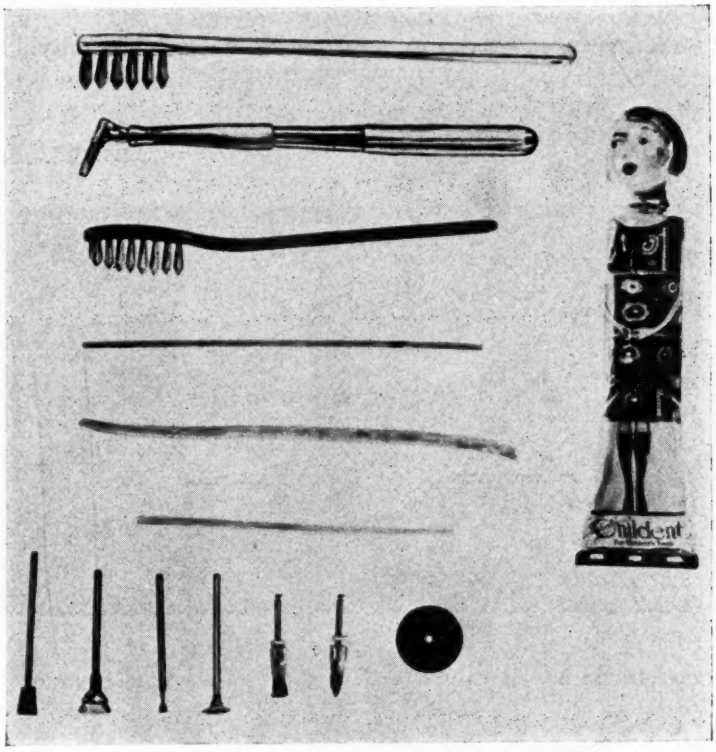


Fig. 1.—Prophylaxis equipment.

PROPHYLAXIS

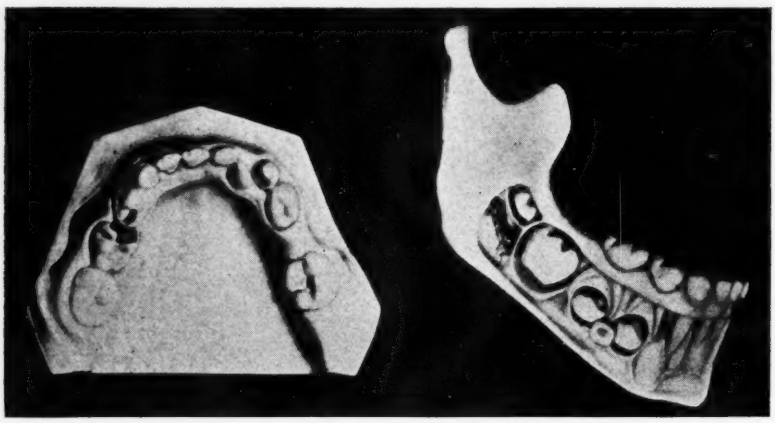
Passing from the preliminary discussion to the technic of dentistry for children, one may wonder that a difference is herein implied between the technic necessary for children's dentistry and that advocated for the adult. Yet important differences are present, and the sections that follow will be devoted to explaining concisely some of these differences.

In prophylaxis for children, the following procedure is usually employed. Disclosing solution is applied and right angle B. S. polishers are used to remove the soft debris. These are followed by the use of cup bristle brushes and the porte polisher. The dentifrice preferred is one to which the child is accustomed or Childent. (If it is the child's first visit, the use of the disclosing solution and the dentifrice may be dispensed with until a later visit when the child's self-assurance is more firmly established.)

If the stain still clings to the deciduous teeth, a small carborundum stone, carefully used, removes it, and the slightly roughened surface is made smooth again with finer abrasives and polishers. Margins of fillings are likewise corrected; and roughened contact points made smooth with very thin special lightening strips, followed by sandpaper strips. A specially prepared brush is then used to clean thoroughly the occlusal surface of the posterior teeth.

Application of disclosing solution is repeated and the teeth are brushed again. Tape floss is then used to clean and polish the interproximal surfaces; and a cotton roll, spread on one end is rubbed over the gums and teeth to complete the prophylaxis. If a mirror is placed in the child's hand, how the gleaming white teeth tickle his vanity!

A lesson on home care is given in conjunction with the prophylaxis. The use of two brushes is recommended, one of the Dr. Butler type with few tufts and stiff bristles, the other of the Dr. West type, medium stiff. It is advised that the two brushes be used successively; first the stiff brush dry and without dentifrice, then



A *B*

Fig. 2.—*A*, study of abscessed deciduous molar and effect of neglect after extraction. *B*, study of jaw of child approximately five years old.

the semistiff brush with dentifrice. The first brush (used by the mother on children under six) is the extra one and is used to insure thoroughness in home brushing.

Mothers today are quick to grasp the value of proper home care and the importance of periodic visits to the dentist for prophylaxis. The ease with which the prophylaxis is accomplished and the confidence that it creates are always gratifying. It furnishes a pleasant link between the operator and the child and serves as a most favorable introduction to any further work such as fillings or other treatment that may follow.

CAVITY PREPARATION AND FILLING MATERIALS

A careful explanation of the filling of teeth for children requires much more detail than the following few paragraphs can afford. Candidly, the facts that follow are almost entirely empirical and are recommended only on the basis of my experience.

The *cavity preparation* observed for children's deciduous and newly erupted

permanent teeth differs slightly from that advocated for the adult. This is based on the fact that histologically, the deciduous tooth differs considerably from its permanent successor, as the deciduous tooth is more loosely constructed and its pulp chamber is much larger in proportion to the size of the tooth.

These differences, considered in conjunction with the well known bell mold of the deciduous teeth, causes the dentin and enamel to be proportionally much thinner, especially on the proximal surfaces near the cervical. For this reason, special caution must be observed when working on these areas and conservation of healthy tooth structure maintained at all times.

With these special precautions before us, a modified Black technic is used for cavity preparation for deciduous teeth (except with germicidal fillings).

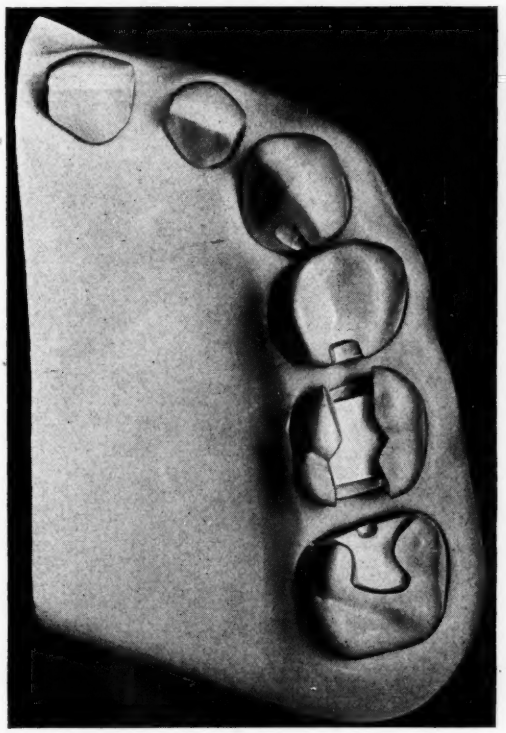


Fig. 3.—Cavity preparation. (a) First permanent molar, slice gold inlay. (b) Second deciduous molar, platinum, gold or silver amalgam. (c) First deciduous molar, copper amalgam. (d) Cuspid, amalgam. (e) Incisors, sandpapering, Arthur method.

The *filling materials* used in dentistry for children may be classified as permanent or temporary. In the permanent group are metallic fillings, such as gold and amalgam, and in the temporary group are fillings such as silicates, cements and gutta percha.

First of the permanent filling materials is gold. Gold is employed in the form of gold foil, the gold inlay, or the gold cast shell crown. *Gold foil* is used for pits and fissures, and is contraindicated in deciduous or in newly erupted permanent teeth where excessive trauma is liable to induce pericementitis. The *gold inlay* is used for deciduous or permanent teeth where it does not entail the injudicious sacrifice of healthy tooth structure and where the pulp of the tooth will be adequately protected from thermal and electrical changes. The *cast shell crown* (Willett) is

used where excessive destruction has made the selection of a crown inevitable for proper restoration of anatomy and function.

Second of the permanent filling materials is amalgam (Minimax). There are three kinds of amalgam that I employ: the first is white gold and platinum; the second is silver; and the third, copper. The first differs from the second, in my observation, only in the ease with which it is manipulated and its smoothness of finish. I use the *white gold and platinum amalgam* for permanent teeth and the *silver amalgam* for deciduous teeth, frequently in the form of the amalgam inlay.[1] *Copper amalgam* has many commendable qualities, chief of which are its adaptability, its ease of manipulation and its germicidal property. These permit its insertion into a cavity with much less retention form and no extension for prevention. Properly manufactured, copper amalgam sets almost as rapidly as silver amalgam when

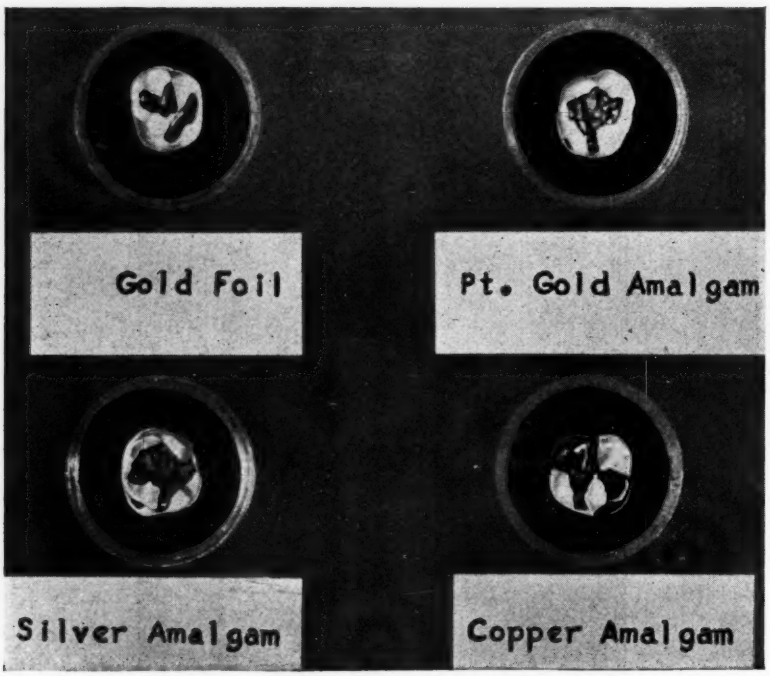


Fig. 4.—Permanent filling material.

it is correctly prepared and inserted[1] and furnishes an incomparable service. It is especially useful in proximal class one cavities and in mouths presenting a high susceptibility to caries.

The temporary filling materials are the silicates, germicidal kryptex and the cements. I use *silicate* and *germicidal kryptex* for anterior permanent or deciduous teeth, having never observed any injurious effects when they are correctly used, and *red copper cement* (Fleck) as a base for permanent fillings in deep cavities or for the treatment of questionable teeth.

Proprietary filling materials which are advocated for use in dentistry for children have been omitted in this discussion, as they have not been advantageous in my experience.

With this brief discussion on cavity preparation and filling materials, we pass on to the widely discussed problem of capping and of treatment for nonvital deciduous teeth.

CAPPING AND TREATMENT OF PARTIALLY AND TOTALLY NONVITAL DECIDUOUS TEETH

Much controversy has already arisen on the subject of nonvital deciduous teeth and "hundred percenters" are championing both sides of the issue. I join those whose stand is conservative and who suggest treatment only in well selected cases.

Capping deciduous teeth has seldom proved successful in my experience, and pulpotomy is preferred in these cases where the pulp is exposed through instrumentation or caries.

In pulpotomy the tooth must first be quiescent. Arsenic fiber (Williams), the size of a pinhead, is used for devitalization. It is applied on a very small pellet of cotton, previously dipped in phenol compound and is cemented without pressure as close to the exposure as possible. In forty-eight hours, the roof of the pulp chamber is removed and the contents are excavated with a large round bur. The

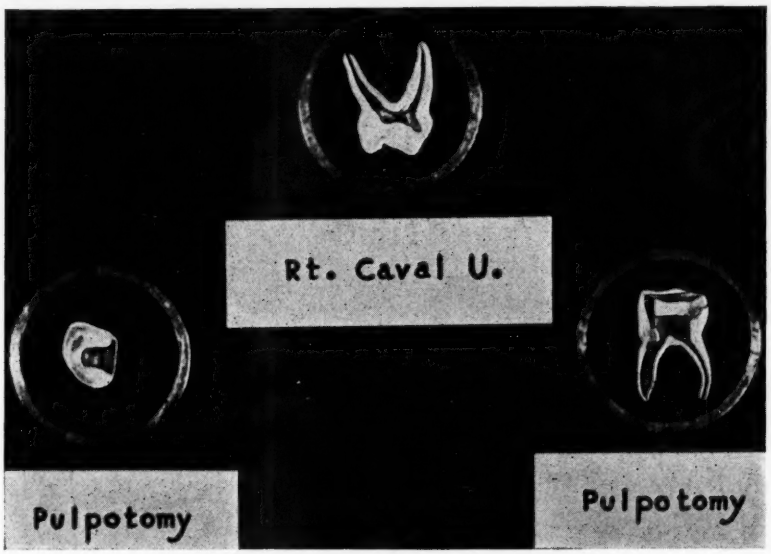


Fig. 5.—Treatment of nonvital deciduous teeth.

tooth is secluded with cotton rolls, and beachwood creosote is placed in the pulp chamber for three minutes. The excess is then removed and the pulp chamber filled with Gysi paste. The tooth is finally sealed with red copper cement, to be kept under observation for three to six months before considering the desirability of placing a permanent filling.

The proper selection and treatment of partially and totally nonvital deciduous teeth remain contending issues. Since treatment cannot be confidently recommended until our technic is more sound and our results are more reassuring from the standpoint of the child's general health, nonvital deciduous teeth are ordinarily extracted in my practice.

INSTRUMENTS FOR EXTRACTION AND CHOICE OF AN ANESTHETIC

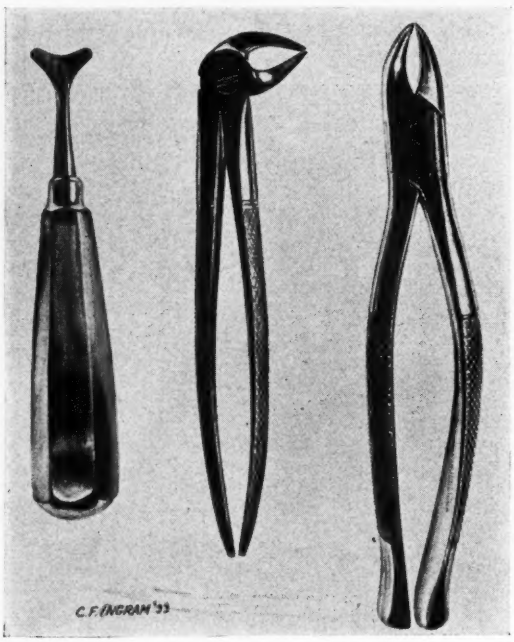
Instruments for the extraction of children's teeth are legion. The selection seems to vary with each operator, and I use only three instruments for 90 per cent of my extractions; a universal upper forceps, a universal lower forceps, and a special universal elevator.

The choice of anesthetic may also vary, and I prefer a general anesthetic for children, unless contraindications are present, as the child's psychologic reaction to a general anesthetic is much more favorable than to novocaine and the needle. The anesthetic selected is nitrous oxide or ethyl chloride.[2]

Premature loss of children's teeth frequently leads to a need for bridges or prosthetics and these will be considered next.

BRIDGES, PROSTHETICS AND PREORTHODONTIA FOR CHILDREN

Emergency bridges for children are reconstructions which not only retain space, but also restore function. If they do not restore function, they are simply space maintainers and should be designated as such. Dr. Willett of Peoria, Illinois,



(*a*) (*b*) (*c*)

Fig. 6.—Exodontia instruments. (a) Universal elevator. (b) Universal lower forceps. (c) Universal upper forceps.

has done much splendid work in this field, and modifications or additions to his technic are frequently presented.

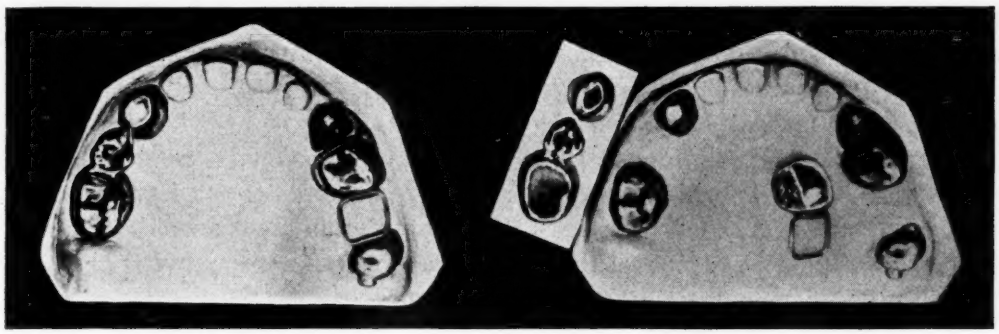
Prosthetic restorations of intricate design are sometimes employed. They may be frequently indicated, but their manufacture is complex and so much in the realm of experiment that a more practical technic must be developed before they can be advocated for general use.

This leads us to one of the most important services for children, the prevention of the need for orthodontia. Much may be done in making orthodontic treatment unnecessary if prospective cases are recognized early enough. These may often be recognized, as abnormal mouth habits often produce abnormal dental conditions which frequently are so typical that the well informed dentist can name the habit by observing the results.

This is particularly true in conditions resulting from thumb or finger sucking;

finger nail, lip or tongue biting; improper pillowing, et cetera. The "false faces" and the broken bodies that result from these and other preventable conditions can be obviated by nipping the conditions in the bud, or, if they are advanced, by referring them to the orthodontist.

For the sake of brevity, I have left much untouched that I would have enjoyed considering. Much that is of importance relative to after care, diet, the endocrines, and other pertinent problems closely related to the practice of dentistry for children. So tremendous a subject can hardly be outlined in so sketchy a treatment.



(*a*) (*b*)

Fig. 7.—(a) Bridge. (b) Space maintainer.

It is only through the concerted effort of all who are doing this work and the addition of every other dentist in practice that the future of dentistry for children may be realized for the profession and for the public. The tremendous possibilities in this field are just becoming apparent. Its forward steps are inspiring. This is the foundation upon which dentistry of the future will rise.

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THE EVOLUTION OF DENTISTRY FOR CHILDREN

Being the Story of the Movement as One Has Watched It Grow

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Chief of Dental Staff, Children's Hospital

LET us go back in our mind's eye to the year 1908 and see how much of the dentistry that was being taught and practiced at that time is still practiced today, or what advance in thought, if any, has developed.

While, of course, in the main we are still cleaning teeth, filling teeth, extracting teeth, making crowns, bridges, dentures, etc., yet look how differently we are now doing these things. In 1908 we did not have the radiograph, nor many other facilities which are now at our command. Great have been the changes, but among all of these we find no particular mention of the care of children, save that at that time they were simply a "necessary evil" about the office.

It probably is no great untruth to admit that the orthodontist had the building up of his practice made easy by virtue of the fact that children were sent to him by the dentist with the primary purpose of furnishing relief to the latter.

The development of this phase of our practice, which may be treated under the head of evolution, from that period has been very interesting. Little attention was paid to the child as a real objective in practice; in fact, so far as I know there were but three people in America other than orthodontists who were thinking very concretely in terms of child care from the dental standpoint. One of these was Dr. Evangeline Jordan in Los Angeles, whose life and work are well known to all of us and to whom we all pay our profound respect; another was Dr. H. C. Puckett of Seattle, whose time was devoted wholly to dentistry for children; the third was the late Dr. Phillip R. Thomas of Minneapolis, although Dr. Thomas' work was largely devoted to orthodontia. In addition, I, beginning my practice in 1908, turned my attention at once to the care of children, and thus began a career which has been both interesting and valuable.

It is true that dentistry for children was conducted from a different standpoint than it is at present, inasmuch as we had to ask for the children, and in many instances did what was to be done for nothing, or for very little at the most. It was truly an educational campaign, but believing it to be good philosophy to keep busy even though time may not be profitably engaged, we carried on the campaign.

Along about 1912 pediatrics was developed as a specialty in medical practice, and there are some of us who know the surprise our medical friends had when they found there were already those who were paying particular attention to the teeth of children. Along about this time, too, the public health nurse was developed, and her interest and activities were added to these other two.

The membership of our early pediatric societies was comprised of pediatricians, dentists interested in children, orthodontists, public health nurses, social

service workers, and any one interested in child welfare. This went along for a little time until finally the pediatricians discarded all the rest of us and confined their pediatric societies to those possessing the degree of Doctor of Medicine.

However, concomitant with the development of pediatrics and public health nursing, general attention to children grew at a rapid pace, and by 1922 there were a considerable number over the country whose practices were limited entirely to children. But many more of us who, while we considered children's dentistry as our first work and were known as children's dentists, were not entirely specialists.

In 1922 a first effort was made to organize a national society of children's dentists. In various places there had been similar organizations, including all who were interested in children's dentistry; as, for example, in the city of San Francisco there was such a society comprised of orthodontists, hygienists and dentists, built around the dental staff of the Children's Hospital. This effort in 1922 to organize the Children's Dental Society did not bear fruit for a year or so later it was disbanded, or rather, it simply faded away, because there was not a sufficient number of specialists.

In 1927 there was organized in dentistry a new society under the name of the American Society for the Promotion of Children's Dentistry. This is rather a stupendous name, but, nevertheless, it is in accord with the spirit and intent of the organization. It contains not only those whose practices are wholly limited to the care of children, the number of whom has greatly increased within recent years, but also any others who are interested in its promotion and who are doing at least some work in the care of children.

This Society has performed its work well. It first set about to form study clubs in various localities throughout the country. Quite a number of these were organized and have served a useful purpose. A committee was appointed to promote the teaching of the subject in the dental schools, and today no small number of the schools have chairs of children's dentistry and clinics equipped for children. Their number is increasing; in fact all of the schools teach something of children's dentistry, though it may be included in the department of operative dentistry. It is being given far greater emphasis than heretofore. Today we have many specialists, among whom are Dr. Haidie Weeks of New Orleans, Doctors Harris and McBride of Detroit, Dr. Rhobotham of Chicago, Dr. Charles A. Sweet of Oakland, and many others. These are outstanding because of the particular contribution which they have made in the promotion of this phase of dentistry. In the state of Oregon, Dr. Sweet under the auspices of the profession conducted an intensive and extensive campaign; Dr. McBride did similarly in Michigan; Dr. Weeks has worked extensively in this phase of dentistry, and Dr. Rhobotham has been called before many state societies in the country; Dr. Drain of Iowa has made extensive contributions through his research work; Dr. Sullivan of Boston as director of the Children's Department in Tufts College Dental School, Dr. McCrum of Kansas City and Dr. Barker of Denver have likewise made their contributions to the progress of dental care for children; and so the work has progressed. Among these must not be overlooked the enthusiastic and self-sacrificing Dr. W. T. McFall of Macon, Georgia. His work in his own state has been of the very highest, and his spirit and en-

thusiasm have been magnanimous; thus the efforts of this society have contributed to the whole scheme of progress.

A committee was appointed to interest state societies in the inclusion of dentistry for children in their programs. This has been accomplished in a marked degree; so that today we do not expect any state meeting to be held without considerable attention given to the care of the child. Similarly with regard to the American Dental Association and the section on Oral Hygiene and Preventive Dentistry, much of the program of which section for the past several years has been provided by the group known as the American Society for the Promotion of Children's Dentistry. There has never been much talk within this group of developing dental care for the child into a complete specialty, but, on the other hand, we have urged practitioners generally to include the child in their practices, for children's dentistry is in reality a part of operative dentistry. Nevertheless, there are instances in which one individual may handle children better than another; therefore it is well for those who prefer, to limit their practices entirely to children. The Trustees of the American Dental Association have recently passed a resolution to be presented to the House of Delegates at the next annual meeting changing the name of the section on Mouth Hygiene and Preventive Dentistry to Children's Dentistry and Oral Hygiene.

The dental curriculum has changed within the past decade from one in which mechanics was emphasized as of prime importance, to one in which the scientific aspect has taken the leading place. The medical profession has changed similarly. The life sciences have been developed, and their contribution to living generally has shown those of us in health service a new light ahead and a definite path to follow which has led into the field of prevention. The sciences to which reference is made are biology, which teaches men how to live, and sociology, which teaches men how to live together. Concomitantly with the development of these, the sociologists have greatly increased, including all departments of social activity, and of which the practice of dentistry is but one. We have moved ahead, then, with this group, in our own field specifically, to carry further the contribution which this society has made.

In the social change which is apparent today, we see in our health practice the field of prevention very clearly ahead; and we know, too, that the time to prevent is before the trouble has begun; therefore, we are having forced upon us more and more, attention to the child.

Thus the practice has grown, until now the child has come to occupy a prominent place among us. We know that it is more desirable to practice "health service" than "repair service," in addition to the fact that our children are really entitled to our best efforts.

This, in brief, is the evolutionary progress made in this phase of dental practice. How naturally it has grown! How thoroughly it pictures the progress of that which is right! The years ahead will be of still greater interest and value, for now we have that great army of sociologists, one part of whose aim is child welfare, with whom we must work. We are trained in dental health service and that will be our contribution to the whole program. Let us be up and ready and with zeal take our place among these agencies—we shall find great satisfaction as well as just compensation.

THE MENTAL ATTITUDE OF A CHILD TOWARD DENTISTRY

H. B. Shafer, D.D.S., Anna, Ill.

ALMOST daily people lament the fact that fear and dental pain during childhood had caused them to avoid the dentist and they became dental cripples for life. It is true that no matter how skillfully teeth are filled or replaced they will never be the same.

If adults in the future are to have strong healthy teeth, we must create in our children a good mental attitude toward dentistry. This is not a difficult thing to do. In fact children can be influenced to look upon dentistry as a necessary routine if parents will tactfully refrain from discussing in their presence some of the unfortunate details of their own experiences. Most operative procedures in the dental office which give children a bad opinion of dentistry are the result of neglect and when related to others are magnified and greatly exaggerated. It is a good example for the child if the father and mother go regularly to their dentist without complaint.

I shall never forget one mother who thrust her child into my operating room at an unfortunate moment, just before closing time, and this is what she said: "Extract his tooth, Doctor, if you can. His eye has been swollen shut for two days; I doubt whether you can do anything for him, whip him if you have to." And she left the office. Is it not a fact that any procedure we may decide upon in a case like this will be stamped indelibly on this little patient's mind, and all through life he will be unable to forget it?

Unfortunate remarks in the home and in public places, such as, "I nearly bled to death"; "It almost killed me"; "The grinding drove me crazy"; do much harm. Is it so strange that little children three years old actually tremble when they meet their dentist for the first time?

I am sure that no one would intentionally make it hard for a child to face his dentist; but remember, one thoughtless remark often discounts hours and hours of constructive suggestions.

Creating a proper mental attitude requires some thought, a little patience and cooperation of mother and dentist. Special consideration should be given each child, and no hard and fast rules can be laid down. However, I hope that I can give a few suggestions which will be helpful in changing the dreaded visit to a pleasant task.

Since the mother is responsible for the toilet of her child's mouth until he is ten years old, it is quite important that she adopt a definite routine at the eruption of the first tooth, about the sixth month. The child will naturally resist any method employed, but firmness will win out, and right here you take an important step in creating a proper mental attitude.

One dental authority suggests that the teeth and gums be massaged with a harmless paste applied on a finger cot. It not only cleans the teeth and soothes the gums, but it accustoms the child to having the finger in the mouth, so that when a dentist attempts an examination later the procedure will not be strange to the patient.

Sometime after the child is two years of age, the mother should begin telling some interesting stories concerning the teeth and allow him to accompany her when she goes to have her teeth cleaned. Let the child see what a dental office is like, meet the doctor under most favorable circumstances, and perhaps a few well directed remarks will excite his curiosity. A toy presented at the psychologic moment will often break the ice.

In the days following frequent references to the pleasant visit may create a desire on the part of the child to return.

After the deciduous teeth are in place, about the third year, it is time for the first appointment. Call your dentist and tell him your child's name and age, ask for an early appointment. It is important that the first meeting be at an hour when the patient, the mother, and the dentist are at their best. Nine until ten o'clock in the morning seems to be an ideal time. At the close of the day the dentist finds it hard to be patient; the activities of youth leave children's vitality at a low ebb, and the mother will be inclined to hurry home to some duties demanding her attention. Children react unfavorably to hurried appointments, and dentists are not seeking last minute patients.

Mothers should prepare the child mentally and physically for the meeting with the dentist and tell him that they are going back to see Doctor Jones, the pleasant man who gave him a present. Tell him that the doctor will probably ride him up and down in a little chair, make his teeth white and show him some funny tooth brushes. Now dress him up within an inch of his life, and act as though you were going somewhere, and be on time. An early start assures a prompt arrival, and the child will avoid rush and hurry, and will be calm and perhaps eager for the experience.

Upon his arrival the thoughtful dentist will see to it that little ears and eyes hear and see only those things which inspire confidence. A smiling dental assistant will probably greet him in the reception room, and a few moments of play with a suitable toy will make him feel important and at home.

The doctor will treat him as though he was the governor of his state, shake hands, call him by his first name and converse on subjects which are of interest to a three-year-old child.

He is placed in the chair, given ample time to look things over, and regardless of how much dentistry is indicated, he is detained only long enough to clean his teeth. The first meeting is so important that many dentists make it more of a social visit, preferring to get acquainted and attempt very little work. To notice his new clothes and give him a deserved compliment concerning his conduct will do no harm. The friendship between dentist and patient can be further developed by a small gift carefully selected. If the psychology is correct, these little patients actually hesitate to leave the congenial atmosphere of the dental office.

On arriving home if the mother will tell the father about the visit, he can do a lot toward that mental attitude if he will just think to do so.

Careless and unappreciative of preventative measures, many people neglect their children's teeth, and about the sixth or eighth year they are forced to go through a terrible ordeal in the dental office. Coaxing, bribing and even force are used; teeth are lost, mental attitudes ruined, and large bills are presented. Take your choice!

CORRELATING DENTISTRY WITH MEDICINE

WALTER T. MCFALL, D.D.S., MACON, GA.

IN PRESENTING this brief résumé of correlating dentistry with medicine, I do so believing that dentistry is a necessary and integral part of the great healing art. Just as the proctologist, the rhinologist, the urologist, the neurologist and the pediatrician have their parts in the practice of medicine, so has the dentist in that vast field he serves, which consists of much more than the mere cleaning, filling and extracting of teeth, more than replacing by prosthesis those masticatory and esthetic organs so necessary to good health and its maintenance. When we consider the task and responsibility which is the dentist's, we must agree that his work is significant and important; for the "mouth is the gateway to the body," and should be guarded, cared for and treated as such.

Just as medicine has made its splendid strides in the last century or two, so in the last half century dentistry has also risen from the plane of a mediocre trade or an occupation to a professional level that is doing much to make life longer, happier and more useful. All branches of the healing art should strive to eliminate the cause for their necessity by making sickness, pain, and the inherited and acquired afflictions and ills, so common to the human race, frowned upon and prevented.

The members of all the healing professions are being sought out as leaders to guide, to teach, and to help others to be healthy, happy and useful; to be more concerned with the vital part they have in shaping human destinies. We are fast coming to accept, as our symphony, that we, as members of this present generation, are living not only for ourselves but also for those generations which are to follow. Those forces which make or mar the destinies of man are more amenable to control today than they were twenty-five years ago. The present development of industrial processes, the various sciences of conservation give us hope, at least, that the worst conditions of poverty, selfishness and ignorance are being done away with. The amazing progress of medicine demonstrates that most of our dreaded ills can be overcome and many others eliminated by simple, preventive means; and finally the laws of heredity when fully known and heeded are surely capable of raising the mental, moral and physical endowments well above where they now stand. Much progress and development are apparent; and, while the average life has been added to some eight years, there is still a vast amount of ignorance about health and disease. The startling research work of a number of scientific men is more than offset by the thousands who still buy patented cures for tuberculosis; by those who continue to use liverwort for jaundice because the leaf resembles the human liver; by those who treat infectious diseases by suggestion; by the thousands who still believe the care of deciduous teeth is not necessary, that they should not be preserved and saved until time for normal resorption and replacement, who have been told "for every child a tooth," who believe a body can be strong, healthy and nourished when food is taken into the stomach through a

mouth whose very contents are filled with filth, decaying sore teeth and gums, harboring the putrefying and decaying food and germs, where pus of the most virulent nature is found, who believe that infected tonsils, glands, and ears, that impaired masticatory efficiency do not cause a great handicap to a child in school and throughout life. We must work earnestly in answer to this appalling challenge and weighty responsibility which come to every man of us. I am saying these things because I tremendously feel the obligation of it, and the need for it. "Progress is the law of the universe," and any one who will not bend his will to this law not only handicaps himself but grievously wrongs and deprives all those whom he should serve, of their rightful part in all which is highest and best.

I feel we all agree, in part at least, with Dr. Charles Mayo, when he said, "The next great advance in the prevention of disease is the knowledge that chronic diseases, acute diseases, and special local diseases, such as neuritis, sciatica, and acute paralysis, come from mouth infections in most instances; also that appendicitis, diseases of the gall bladder and ulcerated stomach are caused by bacterial infarcts in the capillary circulation at the base of the mucous cells in these organs, and are caused in the same manner from local infections. While there are several sources in the body for the entrance and growth of these bacteria, in a local focus the mouth is far the most common situation." Yet we still see and know of certain practitioners in both the medical and dental professions who seem to feel they can work entirely free and separate from one another. I should like to say that I have never listened to a medical discussion, I have never read a patient's chart, I have never attended a minor or major operation, but that I learned something new and needful, and was improved as a doctor of dental surgery. The time has come when we all must believe, "No man liveth to himself, yea, and no man dieth to himself." I sincerely believe that the dental profession stands ready, willing, and eager to assist, cooperate, and consult with the internist, the general practitioner, few of whom the dentist sees today, and any man in any specialty of medicine, to help the patient, the laity everywhere, to be healthy, happy and useful.

Our mutual problem in the future is not so much one of correction and reparation as one of education. This education must be hammered home, night and morning, and must begin with the grandparents. If we all realized that just in proportion as a child is "sold" today on the prevention of communicable diseases and degenerative diseases, on regular examinations, on eradication of ignorance, poverty, and insanity, together with the endless category of preventable maladies that we fall heir to, just in this proportion will the present day child produce a better, healthier, and more useful progeny. On the Post Office in Washington are these forceful and impressive words, "Carry truth and life to all men." But are we doing this, are we fulfilling the aspirations, aims and purpose of our life's work? We cannot change public sentiment all at once; nor can we get legislation without preceding it by education. We must realize that our duty and responsibility to the nation and state are not confined to the care of those diseased conditions of the body; this we have been doing; but we must be concerned as to the best possible health of our communities.

No reputable physician should honestly undertake to relieve or cure a patient suffering from some form of systemic trouble, from maladies of the lungs, heart,

digestive organs or kidneys, without first ascertaining the condition of the mouth and teeth; having some reputable and conscientious dentist who is well informed from the medical side, to correct and clean up the mouth of the patient, thereby eliminating any possible trouble from this source.

Dr. Adolph Knopf, the great lung specialist, has said, "I defy any physician to help or cure a patient suffering with tuberculosis, who has defective teeth." Surely this must be the honest opinion of a number of physicians regarding other systemic diseases. I shall not open that field of systemic foci generally because we never seem to get anywhere on that query and are very much like goldfish, merely going around in a circle without getting any further.

There is no malady of the human race which affects quite so many people as do defective teeth and gums. Because of the prevalence of dental caries and diseased gums, dental troubles have aptly been termed, "the people's disease." We learn that the entire body is affected, the influence being chiefly of four kinds: (1) decreased power of mastication or chewing, due either to decay or irregularities of the teeth; (2) the toxic effect of pus, which is absorbed directly into the blood or is taken into the stomach and intestines; (3) reflex nervous disturbances due to pain, impaction of teeth, cysts, infection, etc.; (4) the possibility of the mouth acting as a breeding point for the bacteria which are well known to cause acute infectious diseases.

Dentistry can help medicine by cleaning and conserving every possible tooth for its maximum life and efficiency. If a man cannot chew, he cannot digest his food, for the first stage of digestion begins in the mouth where food is incorporated with the ptyalin of the saliva and broken into smaller particles and simpler compounds. If a man cannot digest his food, his body is not nourished, tissues are starved and are liable to disease because of lack of nourishment and tone. If a patient's mouth is filled with rotten decaying teeth which are sore and nonusable, which harbor putrefying food and filth to mix with each improperly masticated mouthful of food taken into the body, how can he improve? We need a closer relation and appreciation between physician and dentist, more frequent consultations, more earnest consideration of facts as presented. In the medical schools the students are given possibly three or four lectures on teeth and gums, and later many physicians feel competent to recommend this and that about the part of the human body they have been taught least about, and about the part they are possibly most inadequately informed.

No radiograph is an infallible, positive diagnosis; yet because the physician and the dentist fail to get together, many patients are forced to undergo a tardy restoration to health, forced to remain in a quandary, doubting both medicine and dentistry, their efficacy and necessity, or usually needlessly having sound serviceable teeth ruthlessly sacrificed. Many teeth are condemned by a one-angled, imperfect radiograph, and this alone. Many of these teeth are vital, healthy, useful teeth. Frankly now, can the physician judge better than the dentist? Can a dentist diagnose typhoid fever more effectively than a physician? We all know the answer, but we do believe a dentist can make a better diagnosis regarding the elimination of a tooth or a mouth condition than can the average physician or roentgenologist. Physicians should consult the patient's den-

tist or a dentist whose ability and judgment he respects before marking a tooth as dead, abscessed, or needing to be extracted. A dentist who has treated a patient's mouth and teeth for some time should know best that patient's mouth. The physician should call the dentist, just as the dentist calls the patient's family physician when he needs him, in order to accomplish the most for the patient.

In recommending a dentist to a patient, the physician should not recommend a man who indiscretely practices dentistry or who extracts teeth simply because the physician wants this done. He should have the dentist consult with him, have him see the patient with him, and give the same professional consideration to the mouth and teeth as he does to the removal of an arm, an eye, or a gall bladder.

Dentistry can aid medicine in teaching the laity regarding the proper diet which will build and maintain healthy bones and teeth, thereby materially inhibiting rickets, defective teeth and their allied sequelae. Good teeth, just as good bones, are born—not grown. Dentistry can aid pediatrics in numerous ways, by caring for the deciduous teeth, by aligning oncoming permanent teeth, by maintaining a normal arch and respiratory tract, by preventing malformations of the jaws and head.

The rhinologist and dentist often find their work so close together it overlaps. Many times diseases of the sinuses, eyes, ears, and throat have a primary predisposition for trouble in the mouth. Many cures and alleviations are rendered in the field of rhinology through a strict dental correction.

Neurology with its many diversities is turning to dentistry as never before. No nervous disease is corrected without a dental correction now, and the neurologist in a good measure depends upon the assistance tendered him by the dentist. All sanitariums and hospitals for psychic and nervous diseases maintain an adequate and efficient dental staff. Dr. Cotton, at the New Jersey State Hospital for the Insane, released more than 17 per cent of the inmates after a thorough mouth correction, and in this instance no other corrective or therapeutic treatment was administered.

There should be a close affiliation between the obstetrician and the dentist. Many pregnant women undergo torture from aching, sore teeth during pregnancy because they fear the consequences of extraction or treatment. It is now a well-established fact in medicine, as well as in dentistry, that this fear and pain are needless and without foundation. A pregnant woman should consult her dentist, and by advising him of her condition avoid long sittings, etc., about as soon as she consults her obstetrician, for tooth formation begins fifty days after conception. Any woman who does not follow a diet essentially balanced in those necessary bone and tooth building substances, principally calcium and phosphorus, always has a materially impaired mouth thereafter, because nature goes to the most fruitful source for calcium and phosphorus if it is not supplied in the normal diet, for the new life must be supplied. Therefore without the proper dental attention and diet the pregnant woman's teeth and bones are usually irreparably damaged, and the child begins life as a dental cripple and a bone deficiency cripple because of this easily avoidable neglect upon the mother's part.

The public health man and the general practitioner know they are greatly helped in their endeavors to obtain and maintain good health in children in the preschool and school age, by the part dentistry plays. Those children with healthy, well kept mouths more often miss the common infectious and epidemic diseases so generally encountered in this important period of growth and development. Children with clean mouths maintain a far better systemic immunity; they are more vigorous, attentive and prompt at school, and in play life.

The urologist obtains far better results from a patient with a well kept mouth than from one with a filthy mouth. Dentists often observe the primary lesion of syphilis in the mouth and can materially aid the specialist in this line by maintaining a clean oral cavity to aid in the administration of drugs, etc. The characteristic nose dip, the cleft palate, the lesion slow to heal, all help the dentist to inform the physician of his findings and to aid the patient to have treatment.

That vast field of surgery which considers more especially the mouth, jaws, and even the face, has in a good part been relegated to the dentist in the field of oral surgery. Fractures, ranulae, neoplasms, osteomyelitis, maxillary sinusitis, cleft palate, harelip, plastic surgery, tic douloureux, and many other infections affecting these vulnerable parts are rightfully referred to the oral surgeon.

Those wretched infections of the mouth are, of course, best treated by the dentist: the early forms of stomatitis in children, thrush, cancrum oris, noma, phagedenic gingivitis, herpes labialis, perléche; as well as scurvy, mineral poisons such as mercury and phosphorus, etc., foot and mouth disease, scleroma, Vincent's stomatitis or trench mouth, Ludwig's angina, adenitis, cellulitis in adults. In all these diseases, first seen more often by the physician than by the dentist, dentistry must of course be employed, together with other needy systemic treatment by a physician.

I might well mention many other avenues in which dentistry can, does and should aid medicine, but this brief résumé is intended to call only a few of the more important to mind, to ask both the physician and the dentist to consider that each can help in rendering the best possible service to the laity.

Dentistry is a most important branch of medicine; it is the dentist's duty to be thoroughly competent, and willing to advise in the care of the mouth as soon as the child is born. He should not have the erroneous idea that his duty begins only when the child is first brought to him with carious teeth, periodontal or apical abscesses, etc. The family dentist should be as responsible for the child's health as is the physician, and no parent considers the rights of the child unless there is such cooperation asked—nor is the physician doing his full duty to either parent or child unless he is at pains to impress this fact upon the parents.

May there dawn a day, and that not far distant, when both the physician and the dentist shall realize that each has a necessary part in fulfilling their obligations as guardians of a nation's health and may they with one accord rise up to help humanity obtain and maintain its desire of being a healthy, happy, useful people, well born and well fit, a desire which cannot be bought with gold.

THE FUTURE DENTAL PRACTICE

WALTER C. MCBRIDE, D.D.S., DETROIT, MICH.

WHEN one thinks of the future dental practice, in these days of economic stress, one thinks not of the generation to come but of the immediate future, say the next few years, until the business cycle brings us again to the approach to the days of 1929. We may never reach those dizzy heights in our practices and standard of living, but surely we must ride again a crest of some proportion that fits into the general economic scheme. So I think particularly of the next five, six, or seven years. However, all the good that comes of these days will naturally be carried on into the more distant future.

Primarily, out of this chaos will come a great reduction in the number of so-called "specialists." With so much idle time on their hands, dentists will not refer any work which they can possibly do themselves. In their idle time, as well, many are becoming students again and are picking up the stray ends of forgotten technic and procedures. Among my circle of friends is one chap who has become over-enthusiastic over a phase of dentistry that he would not give a moment of thought in the more prosperous days a few years back. Even with the return of prosperity, I am sure that he, like many others, will not abandon this new source of income. Too, many patients become satisfied with the general service of one operator, the convenience, the saving of time and costs, and will be reluctant to abandon this new affiliation.

Thus, as a natural consequence the number of specialitists will be greatly diminished. The weeding-out process will evolve itself into a survival of the fittest. And because of the fact that few, if any, new men will embark in any specialty in these days, there will not be any replacements for the depleting ranks.

Second, children's dentistry will play a much larger rôle in the practice of dentistry in the future.

Education and interest in this phase of dentistry were rapidly bringing it into its own, but the big impetus came with the depression. Being suddenly deprived of the making of elaborate removable cases, porcelain jackets, pontic bridges and dentures of special materials, the operator was forced to seek new fields of substitution. This need for more work, coupled with the fact that current dental literature was stressing in a convincing fashion the thought that children's work not only paid average dividends but served as a splendid practice builder and maintainer as well, served as an inducement for the termination of the reference of children from his practice.

Many operators have instituted a child's operating room, dressed up in the fashion of the day, in hope of inviting greater possibilities. Some have had such unusual success with this new departure that it has turned into the dominating interest of the practice. Others tell how it has been the practice life-saver, and still

This article was written by Dr. McBride for the January issue of the California State Dental Association Journal.

others advance the conclusion—which has always been true—that a practice, or part practice of children will weather a financial storm better than any phase of dentistry. Clarence B. Vaughan, D.M.D., in a paper read before the Massachusetts State Dental Society, May 2, 1932, stresses a vital point with regard to children in a practice, as follows: "If a dental practice is to thrive and be successful, the constant addition of children is a matter that cannot be regarded lightly. A most tragic condition in the dental profession is the all too common fate of the dentist growing older each year, who shows large gaps in his appointment book simply because he has not added children to take the place of his older patients who are leaving his practice for a variety of reasons."

Because of this new interest in children's work, dental schools will soon be forced to institute some practical program in the interest of children, with the possibility, as well, of building up a graduate school during the summer months for the benefit of the former graduates who have had no training in this work.

Finally, I believe, will come about a reduction in dental fees. This can perhaps be brought about best by a reduction of overhead, and, in turn, the cure for this is, of course, group practices. W. C. Minor, D.M.D., says in a recent lecture, "I believe that the greatest economy and efficiency for dentistry and the best services to be given to a following are through an organized group of men who can work harmoniously together under the same roof." For the sake of harmony and the equality of those housed together, it would seem that a lay business manager of such an institution would be a necessity. This would be the most effective manner of eliminating the lay thought of "Dr. Jone's clinic," or "Dr. Smith's hospital."

Specialty fees, particularly of the orthodontic and surgery groups—the highest paid branches of dentistry—will necessarily suffer a great reduction. This will, in the same breath, reduce somewhat the halo of aloofness and mightier-than-thou attitude of the orthodontic group.

Whether state dentistry comes or not, I am not so sure, in my own way of thinking, but what it is worthy of a trial. The reduced and stipulated fee, common to this type of practice, would bring dentistry within reach of the much mentioned 80 per cent, as well as about one-half of the 20 per cent regularly served. It would provide those dentists who affiliated with it the security of position and income—an income possibly greater than that received from their practices during the past three years. And, lastly, because of decreased competition, it would insure greater income and greater security of income for those who did not affiliate. The greatest difficulty would be satisfying the lay public with the acceptance of what apparently will be clinic procedure, with no choice of operator or individual attention. Should state dentistry prove unsatisfactory to the public after a few years, we, as dentists, would at least be free from scorching denunciation of our fees as private practices were again instituted.

WORKING MEMORANDUM OF THE TECHNIC OF CHILDREN'S DENTISTRY AS TAUGHT IN THE CHICAGO COLLEGE OF DENTAL SURGERY, DENTAL DEPARTMENT OF LOYOLA UNIVERSITY*

CORVIN F. STINE, D.D.S., AND LON W. MORREY, D.D.S., CHICAGO, ILL.

THE purpose of the course in children's dentistry is to teach the student the vital necessity of proper dental care for children, to inspire the student to perform this important type of service, and to instruct him in the fundamental principles and technic involved.

In addition to the instructions that apply to this subject received in the departments of embryology, histology, anatomy, pathology, therapeutics and operative dentistry, the student receives a special course in children's dentistry.

The course consists of a series of fifteen lectures given to the junior students, and clinical work throughout both the junior and the senior years.

The lecture course consists of the following subjects:

Lectures 1 and 2.—1. Definition of preventive dentistry, oral hygiene, oral cavity.

A. Preventive dentistry for the private practitioner.

B. Public health preventive dentistry.

(a) History of the movement.

(b) Development.

(c) Different programs of different communities.

Lecture 3.—The reasons why children's teeth should be cared for.

Lecture 4.—The handling of the child patient.

(a) Different types.

(b) Relation of dentist to patient.

(c) Personal hygiene.

Lectures 5 and 6.—The boundaries of the oral cavity and a review of the histology and anatomy of the deciduous and permanent teeth, and their supporting structures.

Lecture 7.—The development of deciduous and permanent teeth, emphasizing the calcification, eruption and root formation.

Lecture 8.—The relationship between diseased conditions of the teeth and mouth to systemic infections. The effect of acute and chronic systemic diseases on mouth conditions.

Lecture 9.—The etiology of dental decay.

Lectures 10 and 11.—The factors, both prenatal and postnatal, involved in the development of sound teeth.

(a) Diet.

(b) Early and systematic treatment.

(c) Oral prophylaxis.

(d) Eruptive diseases.

(e) Pernicious habits.

*Section of a symposium "Teaching Children's Dentistry in Dental Colleges."

Lectures 12 and 13.—The care of the deciduous teeth.

(a) Cavity preparation.
(b) Filling material.
(c) Prophylaxis.
(d) Therapy.
(e) Extractions.
(f) Space retainers.

Lecture 14.—Early care of the permanent teeth with special emphasis on the first permanent molar.

(a) Care of pits and fissures.
(b) Filling materials.
(c) Preservation of pulps.

Lecture 15.—Malocclusion—causes and effects.

In addition to these lectures, each junior and senior student is required to complete the dental work for at least one child and to follow up the case and to recheck the work and oral conditions every three months until he is graduated.

Upon admittance, the child patient is registered, examined and assigned to a student. The student's first task is to become acquainted with the child and, if possible, perform a prophylaxis at the initial sitting.

Following this, with the aid of the instructor, the student is required to make a tentative diagnosis. The areas to be radiographed are noted and the radiograms taken. If advisable, radiograms of the entire mouth are obtained as an aid in teaching the student developmental conditions. Final diagnosis and plans for the restorative work are made by the student, aided by the instructor, when the radiograms are completed. The student advises the parent or guardian what work is necessary and, with the parent's consent, he begins his operations.

The student obtains the confidence of the child by exercising extreme patience and by explaining each operation. If possible, the initial operations are painless and performed upon an easily accessible tooth. The longer, more tedious and painful procedures are left until the complete confidence of the child is obtained. The student is instructed in every phase of children's dentistry, including cavity preparation, the insertion of various filling materials, extraction, pulp therapy, the insertion of space maintainers, and preventive measures. The student is instructed to watch for and discourage pernicious habits and to instruct the parents how to overcome these habits in the child. The student is likewise instructed how to advise the parent and child regarding home care of the mouth and the importance of proper diet. When the work is completed, the student instructs the child to return to him every three months for inspection and care.

The advantage of this procedure is obvious. The student sees the success or failure of his endeavors. He notes the development of the teeth and supporting structures. He observes the exfoliation of the deciduous teeth and the eruption of their permanent successors. He is taught how to intercept incipient malocclusion. By both instruction and actual experience he learns to watch for areas of susceptibility and to prevent the extensive development of caries.

Every effort is made throughout the course not only to train the student in every practical phase of children's dentistry, but to create within him a desire to perform this important service.

WORKING MEMORANDUM OF DENTISTRY FOR CHILDREN AS TAUGHT AT NORTHWESTERN UNIVERSITY DENTAL SCHOOL*

F. BLAINE RHOBOTHAM, D.D.S., CHICAGO, ILL.

EXPLANATORY STATEMENTS

Definitions:

"A child is any young person at any age less than maturity, but most commonly one between infancy and youth."—Funk & Wagnalls.

Dentistry for children includes the prenatal period because conditions of uterine life have influences of dental concern.

Dentistry for children includes the period of youth because the permanent teeth have not been established in their fixed positions before the age of maturity.

Dentistry for children can be defined as the science of the hygienic, prophylactic, and all other dental care necessary to bring individuals into adult life with the best possible oral conditions.

Preparation of students in dentistry for children includes diagnosis, embryology, uterine life, diet, anatomy, operative dentistry, prosthetic dentistry, orthodontia, therapeutics, histology, pathology, chemistry, growth and development, anesthesia, oral surgery, extraction, habits, dental economics, child psychology, child management, and office equipment.

As every phase of dentistry is included in the content of a course in dental training leading to proficiency in dentistry for children, it would seem logical to have the instruction carried on by the various departments of the faculty.

Due to the lack of *specific* interest that the dental profession has shown toward dentistry for children, the literature is wanting, and therefore there is little to draw from for theoretical teaching purposes. Likewise, clinical interest, with its resulting accumulation of definite data, has not been sufficiently aroused.

Many phases of the teaching of dentistry for children that should be carried on by the various departments have been omitted as the result of the lack of actual experience. Amplification of the generalized knowledge by specific information will temporarily take care of a teaching situation which is now in a period of transition.

Believing that dentistry for children should be taught through all of the departments rather than as a separate course, and recognizing the need for supervision and proper nuturing of the subject material during this period, when better literature, reesarch, and clinical experience are being produced, we have used the following manner of teaching at Northwestern University Dental School:

PLAN OF TEACHING DENTISTRY FOR CHILDREN

Laboratory:

I. Operative technic. (In addition to the course. Taught by regular operative instructors.)

*Section of a symposium "Teaching Children's Dentistry in Dental Colleges."

a. Instruction in mixing copper cements.
b. (3) Compound fillings of amalgam in deciduous molars on dentex.
c. (3) Cement fillings, where indicated, on dentex.
d. (1) Cast gold onlay for hypoplastic first permanent molar.

II. Prosthetic technic. (In addition to regular course. Taught by regular prosthetic instructors.)
a. (1) Bridge on deciduous teeth.
b. (2) Types of space maintainers.
c. (2) Types of habit correcting appliances.

III. Dental anatomy. (In addition to regular course. Taught by regular instructors.)
a. Grinding deciduous teeth to study pulp chambers and root canals.
b. Filling deciduous root canals.

Clinical Requirements:

A. Operative dentistry.
1. Junior $( )
2. Senior $( ) Clinic walks with instructors.

B. Prosthetic dentistry.
1. Junior $( )
2. Senior $( ) Clinic walks with instructors.

C. Anesthesia and minor oral surgery and extraction.
10 General anesthestics.
10 Infiltrative anesthetics. All $ to apply to
5 Conductive anesthetics. general credits.

D. Roentgenogram interpretation.
Ten full mouths (ages five to ten years). (Special instruction.)

Note.—Students use "dollars" instead of "points" to indicate the credit received for clinic work. A minimum requirement is exacted of each student.

In addition to the regular consideration of dentistry for children given by the heads of the various departments of the faculty, the director of dentistry for children, gives the following special lectures.

SPECIAL LECTURES ON DENTISTRY FOR CHILDREN (FOR JUNIOR AND SENIOR STUDENTS)

A. Management of children.
1. Classifications as to type and age.
2. Special problems.
3. Psychology in management of child and parent.

B. Embryology.
4. Formation of facial elements.
5. Development of the teeth (deciduous and permanent).
6. Dentition.

C. Fundamentals of Orthodontia.
7. Normal growth and development of bone.
8. Basic principles of orthodontia.
9. Facts that general practitioners should know.

D. Habits and Their Treatment.
   10. Studies in habits; helpful; harmful.
   11. Correction of harmful habits.

E. Diet.
   12. Prenatal and first year postnatal.
   13. Diet, first year through adolescence.

F. Dental Anatomy.
   14. Comparative studies in deciduous and permanent teeth.

G. Operative Dentistry.
   15. Cavity preparations.
   16. Filling materials.

H. Prosthetic Dentistry.
   17. Crown and bridge.
   18. Special appliances.

I. Therapeutics.
   19. Root canal during deciduous period, deciduous, permanent.
   20. Control of pain.
   21. Special application of materia medica.

J. Pathology (including treatment).
   22. Hard tissues.
   23. Soft tissues.
   24. Abnormalities.
   25. Focal infections.
   26. General health considerations.

K. Anesthesia.
   27. Studies in anesthetics.
   28. Special application and indications.

L. Minor Oral Surgery.
   29. Extraction.
   30. Treatment of early impactions.
   31. Fractures.
   32. Abnormal labial frenums.

M. Mouth Hygiene and Prophylaxis.
   33. Teaching of mouth hygiene and problems.
   34. Oral prophylaxis (prevention).
   35. The dental hygienist (history: functions).

N. Diagnosis.
   36. General considerations, specially applied.
   37. Interpretation of roentgenograms.

O. Economics.
   38. Physical equipment.
   39. Office management.
   40. The successful practice.

A special clinic for children is equipped with twenty-six child-sized operating chairs, which are used for orthodontia and dentistry for children.

WORKING MEMORANDUM OF THE TEACHING OF CHILDREN'S DENTISTRY AS TAUGHT AT THE UNIVERSITY OF ILLINOIS*

ELSIE GERLACH, D.D.S., CHICAGO, ILL.

FOR the past ten years a course in children's dentistry has been an integral part of the curriculum of the University of Illinois College of Dentistry. The dean is the head of this department, and graduate women dentists are the instructors. The staff consists of one full-time, one half-time, one part-time instructor, and one full-time nurse. There is a separate clinic with eight units, waiting room, laboratory, and office for the department. Extractions, orthodontia and x-ray pictures are referred to their respective departments.

All students are required to devote two weeks of their junior year and two weeks of their senior year to the clinic, making a total of 80 hours. One semester of general clinical instruction is the prerequisite. After the completion of the required work, an elective course of 45 hours is offered to a limited group of students interested in further development of their skill in managing children.

Because of the limited time which students have in the children's clinic, and because they realize that it is important for them to have experience in handling the problems of children's dentistry, a graduate course was requested. In response to this request, the clinic is open to all graduates interested in special problems of children's dentistry who wish to work under further supervision, and to those who have a particular problem which they wish to investigate. Under supervision a number of investigations are being made. The instruction is in the nature of a study course, and the amount of time and energy given is optional. No degree or certificate is awarded.

During undergraduate instruction in the junior year, the department aims to acquaint the student with the nature of handling the child patient and performing the most common dental operations. This is accomplished by means of lectures and demonstrations. The class is divided into small groups and each group reports to the clinic for all the clinical hours of two consecutive weeks to which it has been assigned. The time has been arranged in this manner so that the student may concentrate on this subject without interruption by appointments in the other departments. As the groups are small, it is possible to give each student almost constant individual attention. During the first few days in the clinic, lectures and demonstrations are given on diagnosis, management of patients, prophylaxis, diet, and simple operative procedures. Patients ranging in age from two and one-half to twelve years are assigned to the students. The patients have previously, been carefully selected by the staff so that many types and conditions may be demonstrated. The student receives the patient and parent in the waiting room. Children are accepted only when accompanied by a parent. This enables the student to become acquainted with the child-parent problem. He makes out the history chart, obtaining from the mother such information as age, school grade, previous illnesses,

*Section of a symposium "Teaching Children's Dentistry in Dental Colleges."

habits, diet, etc. The child is then taken to the clinic by the student, and the parent is requested to remain in the waiting room. From then on the student is responsible for the management of the patient. He examines the mouth, charts the teeth, and indicates any abnormalities. If possible a prophylaxis is given. The charges for a prophylaxis include the price of a tooth brush, and the student must show the child how to brush his teeth and how to take care of his tooth brush. Usually the mother is asked to be present during this procedure, and she is instructed also so that she may help the child practice proper tooth brushing. The student then outlines the necessary dental operations to the mother and explains why these operations are necessary. The charges are discussed and an agreement is made with the mother to return to have the necessary work completed.

If the mother is willing to make the necessary sacrifice of time and money to have the work properly done, every effort possible is made by the department to help her in developing the child so that he may have good teeth and well-developed arches. She is advised by the student and instructor in matters of diet and the breaking of pernicious habits. After the preliminary work is completed, she is placed on the recall list and cards for appointments are sent to her every few months for follow-up work. We have been able by this system to work up an interesting and interested group of patients. In some instances all the children of the family are taken care of. When such a patient is assigned, the student sees the value of preventive measures and he is encouraged to do dental work for children. Thus at the end of the junior year a student has gained the knowledge of the necessity of dental work for children.

During the senior year the student is instructed in the more complicated procedures of the work. Root canal therapy, partial dentures, large restorations, and space maintainers are added to the program.

In the senior elective course the student is required to complete all the work for one patient, and this must include operative and therapeutic work, and a space maintainer. In this case he is confronted with the problem of reconstructing a badly broken-down mouth. He is also requested to write a paper on the subject of dental hygiene suitable to present to a group of school children or one on a dental subject for a parent group.

The department of children's dentistry of the dental college and the department of pediatrics in the medical college cooperate in furnishing medical and dental care to a limited group of patients. The pediatrics department gives a one-semester course of lectures in pediatrics to dental students, and the children's dental department reciprocates with a lecture to the senior medical students on the care of children's teeth.

ADVANTAGES OF NITROUS OXIDE AND OXYGEN ANESTHESIA AND ANALGESIA IN THE PRACTICE OF PEDODONTIA

CARL L. RISTER, D.D.S., ST. LOUIS, MO.

ASSUMING that the technic and theory have been mastered by the operator, the problems presented in the practice of juvenile dentistry are the control of pain and the elimination of the fear of pain.[1] If normal resorption has occurred, a deciduous tooth may, of course, be lifted from the tissue with a scaler or other instrument with practically no pain. But, if resorption is not complete, the pain of extraction would be about the same as that of a permanent tooth extracted without an anesthetic. It is frequently stated that if the operator first gains the child's confidence he may then proceed as he wishes, but it is not fair to misuse that confidence and cause pain.[1] Cavity preparation and other dental treatment are often the same ordeal to the child as extraction is; so even then our problem remains.

The next question is the choice of the anesthetic to be used. Many disadvantages immediately come to mind when ether, chloroform, ethyl chloride, somnoform, etc., are mentioned.[2] I believe nitrous oxide oxygen to be the perfect anesthetic for children, with the knowledge we have at this time. Children are tolerant to any number of nitrous oxide oxygen administrations without ill results. The only after-effect is sleepiness, and the child usually takes a nap after reaching home. To quote from Wood: "One boy with congenital bladder malformation had seventeen nitrous oxide anesthetizations over a period of two years, beginning when he was two years old, lasting until he was four. One girl of five years had ten anesthetics within two months, three of them were for major operations and seven for cystoscopies." Citing several such examples, the conclusion was, "No untoward effects of repeated anesthetization were ever noted."[3]

In my own experience, nitrous oxide and oxygen anesthesia has been administered to the same child as many as four times in one week. The same patient, under observation for several months, shows no untoward effects and, as she expressed it, would like to go to sleep again because she sees "pretties."

The precaution to be taken is that when nitrous oxide and oxygen anesthesia is to be used, the child does not eat heavily before the operation, because nausea may result. I usually prescribe only orange juice before the appointment. This is a pleasant method of giving glucose and alkalies, and thereby mitigating the by-effects of nitrous oxide anesthesia.[4]

For the extraction of abscessed teeth, this method is the one of choice to prevent autoinoculation. Tissue injured by disease is less resistant than normal tissue; so interference with the blood supply by local injections is contraindicated where extraction, due to disease, is necessary.[5]

The technic of administration of nitrous oxide and oxygen anesthesia to children is practically the same as that to adults. The signs of anesthesia are the

same in both cases. Since the color changes are not so noticeable in pale children, it is perhaps better to remain on the side of light anesthesia in these cases. A skilled anesthetist may rely upon the respiration, eye, and pulse to judge the state of anesthesia. Premedication is not usually necessary for children, but in some few cases it is a great help in gaining more relaxation of the patient. I have found that prescribing a 1.5 gr. capsule of pentobarbital sodium is very beneficial in difficult cases. This brings on a condition somewhat similar to "twilight sleep," but the effect rapidly disappears. Sodium amytal may be used but the action is not so rapid.

When nitrous oxide and oxygen anesthesia is to be used, some pleasant conversation is carried on—the topic depending upon the individual—to interest him in something besides the operation at hand. No time is wasted coaxing the child. He is seated in the chair with the feet hanging to the side of the foot rest, to prevent stiffening or bowing up of the body should he experience excitement during induction. Owing to the bad psychologic effects, no visible restrains are used.[6] Remarking to the effect that, "This will keep your clothes clean," the operator places a long towel over his arms; and during the induction the dentist or assistant ties the towel securely behind the chair, thus binding the child's arms to the body and securing him in the chair.

The mouth prop should always be placed between the teeth before the anesthetic is administered, because there is always some rigidity during this type of anesthesia, making it impossible to open the mouth after sleep is induced. It is also a safety measure for those cases in which some nasal obstruction might cause asphyxia. A damp towel or piece of gauze is placed over the mouth to prevent breathing of air. There is usually no objection by the child to the placing of the mouth prop; we say, "This is just like a piece of bubble gum—nice and rubbery."

Children are very susceptible to suggestion; the resourceful anesthetist may take them for an airplane ride, on a merry-go-round, or through any number of pleasant experiences during the period of anesthesia.

Properly handled, the anesthetic may be made very pleasant. At the stage of analgesia we lift the lid of a musical powder box which starts playing. This aids materially in causing the patient to slip into the anesthetic stage quietly, and so far as I have been able to learn by questioning my little patients leaves a memory of music of exaggerated sweetness. I am told by the one who taught me the use of this article in anesthesia that the sharp notes produced by the old fashioned music box produce even better results than the soft waltz time of the powder boxes. I can enthusiastically recommend it, for the patient can be literally seen to slump into relaxation at the sound of the chimes. I would suggest as a reason for this that during the last stage of analgesia, the conscious mind may cease to function and only the primitive senses are active. Such factors as judging of time and distance are lost, but the hearing becomes very acute. In this stage the effect of the chimes is very profound upon the subconscious mind.

The anesthesia is in the charge of a skilled anesthetist, and the operator does not interfere with her work. The planes of anesthesia in children are

narrow, and close attention must be given to details. The technic of gas mixtures is flexible, and each case is treated individually. The reaction of the patient only serves as a guide, and what can be said of time or number of breaths is only average, not to be taken definitely. I generally start the patient breathing 100 per cent nitrous oxide for about six breaths, then giving 95 per cent nitrous oxide and 5 per cent oxygen. Very young children may be given 10 per cent oxygen and 90 per cent nitrous oxide, gradually increasing the nitrous oxide until 95 per cent is being given. The induction period is usually about one minute; and within ten to thirty seconds after, the surgical stage is reached. The symptoms of this state are: lack of corneal reflexes, breathing rhythmic and firm, eyeballs glassy appearing and fixed off center, normal color. While this state is maintained, the necessary dental operations are performed. Moderate cyanosis is not necessarily a danger signal, but the symptoms to be avoided are: pupil of eye dilated and fixed; rigid, jerky muscles, and light and rapid respiration. Proper manipulation of the oxygen rapidly overcomes any unfavorable symptoms and brings the patient back to safety. Occasionally a young child momentarily stops breathing while under the anesthetic. I have always been able to restore normal respiration by a sharp downward push on the chest with the flattened hand and increasing the oxygen percentage for the next breath. While I believe artificial respiration to be the best method[7] of resuscitation, as an added precaution a hypodermic of alpha-lobelin, both a respiratory and a cardiac stimulant, is kept at hand.

For those emergencies which sometimes arise, this suggestion may be helpful in maintaining a slightly prolonged anesthetic when the operator is working alone. The induction is carried out in the usual manner, then the mouth is opened with the mouth gag, the nasal inhaler closed, and 100 per cent nitrous oxide turned on. This, especially when a McKesson machine is used, forces breathing of pure nitrous oxide through the nose. Enough oxygen for safe maintenance is obtained through the open mouth. This technic has been used successfully for more than a year, and while I am not favorable to the use of nitrous oxide and oxygen without an anesthetist, yet I feel that it can be safely recommended for emergency work. I believe the types of machines which deliver gas under pressure are best for this work.

Vigorous outdoor children are hard to anesthetize with nitrous oxide and oxygen alone. This is also true of patients with active or arrested malaria. In these cases, ether vapor with the nitrous oxide and oxygen proves very valuable. On one occasion, where an immediate dental operation was necessary, a very frightened youngster refused to take an anesthetic, either local or general, peacefully. He so successfully fought the gas that we were forced to administer ether with it. Ether may be used without causing vomiting if the ether tank is opened gradually, giving a slow induction, and at the close of the operation shutting off both the nitrous oxide and ether, and giving pure oxygen. The most violent objector may be subdued by this technic, and the cooperation of the patient is not necessary. By this method, only enough ether vapor is used to secure narcosis, and the greater objections to ether are overcome. Greater relaxation is obtained by this method.

CASE REPORTS

CASE 1. A girl, aged six years, presented May 12, 1932. Patient had been referred by family physician. Dental treatment had been started; one filling had been made, but thereafter the patient refused treatment, not even permitting a mirror to be placed in her mouth. She was a normal child physically and mentally, but for some reason had an unconquerable fear of the dentist. After some time of talking to the child and gaining her confidence, an examination was made which disclosed twelve cavities in the permanent and deciduous teeth. At the subsequent visit September 6, 1932, nitrous oxide and oxygen anesthesia was administered, cavities were prepared and filled in the maxillary and mandibular first permanent molars. In a like manner, the remaining cavities were taken care of on later visits. There was no fear on the part of the child, and she showed confidence and even affection to the nurse and operator thereafter.

CASE 2. A boy, aged nine years, a normal child. Maxillary premolars were erupting to the buccal on account of roots of deciduous molars remaining. Patient had refused to have work done under local anesthesia. He was referred to this office November 17, 1932. Nitrous oxide and oxygen anesthesia was administered and the deciduous roots were removed.

CASE 3. A girl, sister of boy in Case 2, aged six years. There was decay in the deciduous teeth and roots of the mandibular teeth were remaining. Nitrous oxide and oxygen analgesia was administered and roots were removed without pain or resorting to complete anesthesia.

CASE 4. A boy, aged eight years. Pulpotomy was performed on mandibular right first permanent molar. The operation required about fifteen to twenty minutes. Uneventful anesthetic.

CASE 5. A girl, aged eleven years, was referred to this office after repeated attempts of family dentist to make necessary fillings. The child was apparently subnormal mentally. At the second visit the work was begun, using nitrous oxide and oxygen anesthesia for all cavity preparation. The permanent molars were filled and thereby saved.

A record of extraction of deciduous teeth of forty-nine patients under twelve years of age, which I performed at City Hospital No. 1 shows that all were done under nitrous oxide and oxygen analgesia and not one complained of pain.

Few reports on anesthesia for children are available, especially in the field of dentistry, making this an extensive field for observation and research.

CONCLUSIONS

1. There are few contraindications for nitrous oxide and oxygen anesthesia.
2. Anesthesia may be sufficiently prolonged for careful cavity preparation or pulp treatment.
3. Fear of pain is abolished, and confidence is gained by the use of this pleasant anesthetic.
4. In certain cases analgesia is very useful.
5. There are no ill-effects from repeated anesthetization.

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ABSTRACTS OF
CURRENT LITERATURE

NUTRITION AND PEDIATRICS

By Samuel Adams Cohen, M.D., New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

The Significance and Treatment of Pyuria in Children. James R. Wilson. N. Y. State J. Med. **33**: 7, 1933.

Wilson's autopsy findings of the urinary tract in infants and children who showed pus in the urine lead him to believe that the older conceptions concerning the so-called "recurrent pyelitis" have to be altered. He and other observers have found that with comparatively few exceptions the anatomic basis of the so-called pyelitis in infants is probably a suppurative nephritis. In older children the pathology of the condition has not been definitely established, but the meager data now available suggest that fundamentally the processes are similar.

Most students interested in pyuria in children hold that obstruction in the ureter (with a secondary stasis of urine) is the most common factor which causes the acute pyelitis to become chronic. While some observers feel that the obstructions to the outflow of urine are the result of inflammatory processes in the ureter, this investigator along with others has found that congenital defects are the most common causes of strictures in the ureter.

Accordingly, while rest and quiet and fluids still remain the most important factors in the treatment of the so-called "acute pyelitis," the author rightfully states that in those subjects who do not respond to treatment after a reasonable length of time, the urinary tract should be investigated for possible obstructions, and if such are found it is often possible for a skilled urologist to relieve the condition.

Hyperparathyroidism: A Distinct Disease Entity. Walter Bauer. J. Bone & Joint Surg. 15: 1, 1933.

Bauer defines hyperparathyroidism or generalized osteitis fibrosa cystica as a clear-cut, distinct, disease entity caused by an increased secretion of the parathyroid hormone. The disease is characterized by definite alterations in the calcium and also phosphorous metabolism as well as by certain symptoms and signs. In hyperparathyroidism (1) the serum calcium values are elevated sometimes as high as 23.6 milligrams per 100 c.c. of blood: (normal serum calcium varies between 9.5 to 10.5 milligrams per 100 c.c. of blood) (2) there is a decreased serum phosphorous value often as low as 1.4 milligrams per 100 c.c. of blood: (normal value of phosphorous ranges from 4 to 5 milligrams per 100 c.c. of blood) and (3)

there is an increase of calcium and also phosphorous excretion via the urine and there is also an increase of phosphorous excretion via the gastrointestinal tract.

In addition to these definite alterations in the calcium and phosporous metabolism any or all of the following signs and symptoms may occur: (a) polydipsia, (b) polyuria, (c) general weakness and loss of strength, (d) anorexia, (e) loss of weight, (f) indefinite muscle and joint aches and pains which are sometimes considered as an arthritis or as a neuritis, (g) bone tenderness—and sometimes there is fracture of the bone following slight trauma, (h) bone swelling or tumors frequently diagnosed as epulis of the jaw or giant cell tumor in other bones, (i) ureter and kidney stones (usually bilateral), and (j) anemia with leucopenia. Characteristic x-ray findings of hyperparathyroidism are generalized decalcification, bone tumors or multiple bone cysts.

Bauer states that all the available laboratory and clinical data shows that arthritis and Paget's disease are never generalized skeletal diseases. This fact alone argues against these diseases being of parathyroid origin.

The Effect of Therapeutic Doses of Dilute Hydrochloric Acid on the Teeth. E. C. Stafne. Proc. Staff Meetings Mayo Clinic **8**: 11, 1933.

Stafne points out that in some instances the administration of dilute hydrochloric acid by mouth results in decalcification of the teeth. The degree and rapidity of decalcification undoubtedly vary with different individuals, and moreover it appears that the susceptibility of certain persons to the effect of acid on the teeth must be due to some constitutional predisposition which concerns itself either with the inherent structure of the tooth or perhaps to some unknown metabolic factors affecting the individual.

The author, who reports this study from the Section of Dental Surgery, Mayo Clinic, has noted that the areas of the teeth which first come in contact with the dorsal surface of the anterior part of the tongue are the first to show evidence of decalcification. Accordingly the patient who is able to view the labial surface only is often unaware of any change until decalcification has reached a stage at which pain appears. The knowledge that decalcification begins on, and is usually confined to, the palatal surfaces of the maxillary teeth is therefore important in that it leads to early recognition of the condition. Since the glass tube does not always offer adequate protection, added precautions must be taken to avoid decalcification of the teeth. In this respect Stafne wisely states that an alkaline mouthwash should prove of value after acid medication at mealtime.

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EDITORIAL

Specialists

ACCORDING to Dr. J. B. Squier, President of the American College of Surgeons, specialists in the various and sundry departments of medicine should be required to take adequate training to warrant their making use of such appellations. He has pointed out that additional and highly specialized training should be required before one should practice as a specialist, and that this conviction has been rapidly growing both within and without the profession. He also goes on to say that certain European nations have made definite progress toward the legalization of specialists, and that now this question is being squarely put up before the professions themselves. Bills have been introduced in some state legislatures with a view to legalization of specialists; and it will be a sad commentary on the profes-

sion in general, according to Dr. Squier, if further licensing by the government becomes necessary, when the standards should properly be supplied by the professions themselves. He recommends that the requirements for the training of specialists should come from within the profession, and not from without. Progress has created new responsibilities, which fall not upon governments, but upon those who are masters of scientific methods, the professional people themselves, and must be shouldered by them if the profession is to retain its autonomy and independence.

Fortunately, orthodontia, the oldest department of dentistry to be specialized, through the foresight of some of its leaders several years ago anticipated the culmination of the above trend of thought and organized the American Board of Orthodontia, a board created from within the American Society of Orthodontists. In anticipation of the necessity for a standard of efficiency being attained in specialization, eventually no doubt this move will be the vehicle for the solution of this problem, within the orthodontic specialty at least. It cannot be denied at this time that a great many departments of both medicine and dentistry have confronting them this problem which must be solved.

"When is a specialist a specialist?" is the fundamental query, and how much specialized training should be required before he has the just right to set himself up as being equipped with more knowledge, experience and talent pertaining to some particular department of medicine and dentistry than his confreres?

The final report of the Commission on Medical Education indicates its opinion in that only those who have had thorough training should be permitted to practice as specialists, and also admonishes that there should be a register of specialists in each state to provide the public with information as to the ability of specialists. For the commonwealth, the city or the municipality to set itself up by means of boards or special boards attached to dental and medical boards for the purpose of passing on the ability and talents of specialists in both medicine and dentistry, is thought by the great majority to be fundamentally wrong and unsound because of the political background involved. The ability of specialists can be passed upon legitimately and intelligently only by those within their own specialty, those who understand the various ramifications and are able to appreciate and appraise the line involved between mediocre ability and outstanding ability in the particular line which the specialist is supposed to obtain. The specialist is expected to be an expert in his line, therefore who knows better whether he is an expert in his line than his own confreres who speak his own language.

The specialty of orthodontia should be proud of the fact that it has taken a step in advance upon this subject and is out in front in the field, in its own specialty, far in advance of these demands coming from the public. —*H. C. P.*

"IN MEMORIAM" RESOLUTIONS

Joel Tillman Campbell

Dr. Joel Tillman Campbell was born near Seminole, Pinellas County, Florida, November 12, 1891. After graduation from high school at Largo nearby he devoted several years to the citrus business. In 1912 he entered the Southern Dental College of Atlanta, graduating with distinction in 1915.

Immediately after graduation, Dr. Campbell opened an office in Largo. Two years later, in November, 1917, he moved to St. Petersburg. When the United States joined the Allies in the greatest of all wars, Dr. Campbell was commissioned first lieutenant, Dental Corps, United States Army, and was in active service from October, 1918, to May, 1919.

In 1924 Dr. Campbell decided to specialize in orthodontia, and after taking the Dewey Orthodontia Course in New York he took up this specialty, dividing his time between his St. Petersburg and Tampa offices. Dr. Campbell in 1921 was a prime mover in the creation of the St. Petersburg Dental Society, and served as its first president. Throughout his professional career he was a loyal supporter of the American Dental Association, the Florida State Dental Society and the West Coast Dental Society, serving it as president for the year 1926-27. In 1930 he was the first secretary-treasurer of the Orthodontic Study Club of Florida.

Dr. Campbell was a charter member of the St. Petersburg Civitan Club, at one time serving as president, and a member of the Largo Masonic Lodge and Egypt Shrine Temple of Tampa.

WHEREAS, Almighty God in His infinite wisdom has called from his many years of service our fellow practitioner, Dr. Joel Tillman Campbell;

WHEREAS, We the members of the Orthodontic Study Club of Florida do hereby express our deep sense of loss at the passing of one of our most esteemed members,

Resolved, That we, members of the Orthodontic Study Club of Florida, cause these resolutions to be spread on the minutes; and be it further

Resolved, That copies be sent to the members of the family and to the dental journals for publication.

W. GLENN PHILLIPS, President,
LELAND T. DANIEL, Sect'y-Treas.

NEWS AND NOTES

Thirty-Second Annual Meeting of the American Society of Orthodontists

The Thirty-Second Annual Meeting of the American Society of Orthodontists will be held November 8, 9, 10, 1933, in the Biltmore Hotel, Oklahoma City, Oklahoma.

W. E. FLESHER, President,
CLAUDE R. WOOD, Secretary.

Chicago Centennial Dental Congress

The Chicago Centennial Dental Congress, in conjunction with which the Diamond Jubilee of the American Dental Association will be held, will convene at the Stevens Hotel, August 7 to 12, inclusive.

American Society of Oral Surgeons and Exodontists

The fifteenth annual meeting of the American Society of Oral Surgeons and Exodontists will be held in the Stevens Hotel, Chicago, August 4 and 5.

A. L. FREW, President,
4105 Live Oak Street,
Dallas, Texas.
HARRY BEAR, Secretary,
410 Professional Building,
Richmond, Va.

American Dental Assistants Association

The Stevens Hotel has been designated as headquarters for the ninth annual meeting of the American Dental Assistants Association which will be held in Chicago, August 7 to 12. For further information address

RUTH M. CLARK, General Secretary,
Suite 1-4, Scofield Building,
Minot, N. D.

North Carolina Dental Society

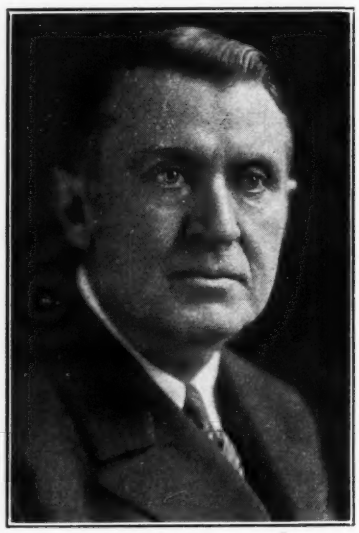
The fifty-ninth annual meeting of the North Carolina Dental Society will be held at the University of North Carolina, Chapel Hill, June 6, 7, and 8. All members of the American Dental Association are cordially invited.

D. L. PRIDGEN, Secretary-Treasurer,
Fayetteville, N. C.

Dr. George B. Winter Receives Jenkins Award

The Jenkins Memorial Medal for the outstanding achievement in dentistry during the past year has been awarded to Dr. George B. Winter of St. Louis for his contribution of research in connection with the mandibular third molar when impacted.

This award is of particular interest to orthodontists because Dr. Winter has on many occasions appeared before the American Society of Orthodontists, and because he has been a close student of orthodontia and orthodontic problems for many years. In fact, Dr. Winter's early training after graduating from school was along orthodontic specialty lines, and he recived great inspiration from the activity and growth of the specialty of orthodontia. It is of interest to know that the inspiration for the original classification of the mandibular third molar when impacted, as originated by Dr. Winter, was received as a result of the Class I, Class II and Class III classification which was applied to the science and practice of orthodontia as a diagnostic aid.



Dr. George B. Winter

His classification of the mandibular third molar when impacted makes it possible to interpret intelligently this tooth when its removal is indicated, also giving the specialty of orthodontia a working knowledge of its variation of position as related to the arch and the second molar, the damage this tooth can bring about in connection with orthodontic treatment, and the question of retention in certain types of cases.

In 1913 he presented to the dental world the first scientific treatise on exodontia, and in 1926 an original book on the principles of exodontia as applied to the mandibular third molar when impacted.

In addition to his research he carries on a practice which is confined to the specialty of exodontia, is professor of Exodontia at the Washington University, School of Dentistry, is head of the Research Department at the University, teaches undergraduate and postgraduate work, is a member of numerous research societies and is also a member of the Board of Trustees of the American Dental Association.

The Jenkins Memorial Medal was established fifteen years ago and is awarded each year by the Connecticut State Dental Society.

The Southern Society of Orthodontists

The thirteenth annual meeting of the Southern Society of Orthodontists will be held at The Homestead, Hot Springs, Virginia, November 13, 14, and 15.

A cordial invitation is extended to all ethical members of the dental and medical professions.

N. F. Muir, President,
Shenandoah Life Building,
Roanoke, Va.
William P. Wood, Jr., Secretary,
442 W. Lafayette Street,
Tampa, Fla.

Association of American Women Dentists

The twelfth annual meeting of the Association of American Women Dentists will be held at the Stevens Hotel, Chicago, on August 7, 1933.

A cordial invitation is extended to all women dentists.

Geneva E. Groth,
1301 Medical Arts Building,
Philadelphia, Pa.

Prize Essays for the Centennial Dental Meeting, New York, Dec. 3, 1934

So as to create further stimuli in dental research, and at the same time to enable any individual who has something new, an opportunity to present his material, the *Centennial Commission*, representing the First and Second District Dental Societies, announces a series of suitable Centennial medals and cash prizes, to those submitting the most acceptable papers relating to the field of dentistry.

1. Eligibility. There will be two groups. (a) The senior—those individuals who have been graduated ten years or more. (b) The junior—those who have been graduated less than ten years, and students of a recognized educational institution.

Membership in good standing of any bona fide dental, medical, chemical, anthropological, biological or scientific society; or duly registered students of a recognized educational institution, prior to submission of the manuscript.

2. Date. Papers are to be submitted on or before May 1, 1934, to the Secretary of the Centennial Commission. An abstract of the paper, with *only* the identification mark, on or before February 1, 1934.

3. Identification. The manuscripts and all drawings, diagrams, photographs, tables, data, etc., shall be sealed in a plain wrapper or envelope which shall bear on the outside some symbol, group of letters, figures, or other identification mark, and accompanying each such sealed packet or envelope, another sealed envelope having on the outside a duplicate of such symbol, group of letters, figures or other mark, and within this sealed envelope shall be placed the name and address of the person submitting the manuscript.

Complete details will be published at a later date.

Bernhard Wolf Weinberger, President,
Floyd G. Rea, Secretary.

International Dental Federation

At the International Dental Congress, held in August, 1931, in Paris, one of the seventeen sections expressed the wish that a prize competition should be inaugurated in order to solve the problem of the treatment of infected root canals, a septic condition, which, as is well known, may be the cause of a number of chronic diseases.

This request has been referred to the Executive Council of the Fédération Dentaire Internationale, constituted by the representatives of forty-three affiliated countries, which will consider the question at the session which takes place in August at Zürich.

This contest has evoked a flood of protests, because of the misconception that it entailed the torture of a large number of animals.

To those who know the preparatory work which has been done by the Scientific Commission and which has led up to this contest, any idea that these experiments could be undertaken by the general physician or dentist is absurd. The general practitioner has neither the knowledge nor the facilities at his command which are necessary to comply with the humanitarian and scientific safeguards which will be required.

In reality these experiments can be carried out only at a few university centers.

The Bureau of the F. D. I. carefully considered the whole question at a meeting held at The Hague a short time ago, and, in order to remove the misconceptions which have arisen, will propose that the following stipulation be inserted:

No experiments will be considered to have complied with the stipulations of the contest unless they are carried out in the scientific laboratory of a recognized university.

The F. D. I. will, when the time comes, publish the names of these universities.

V. VILLAIN, President,
Paris,
CH. F. L. NORD, Secretary General,
The Hague.

Items of Interest

Dr. Richard A. Lowy, formerly associated with Dr. Ralph Waldron, announces the opening of his offices at 190 Clinton Avenue, Newark, N. J., for the exclusive practice of orthodontics.

Dr. Arnold J. Labbe announces the removal of his office to 1110 City National Building, Lansing, Mich. Practice limited to orthodontia.

Dr. Martin Dewey died suddenly in New York City May 14, 1933. Since this issue of the JOURNAL is on the press, a more extended obituary notice will appear in a later issue.